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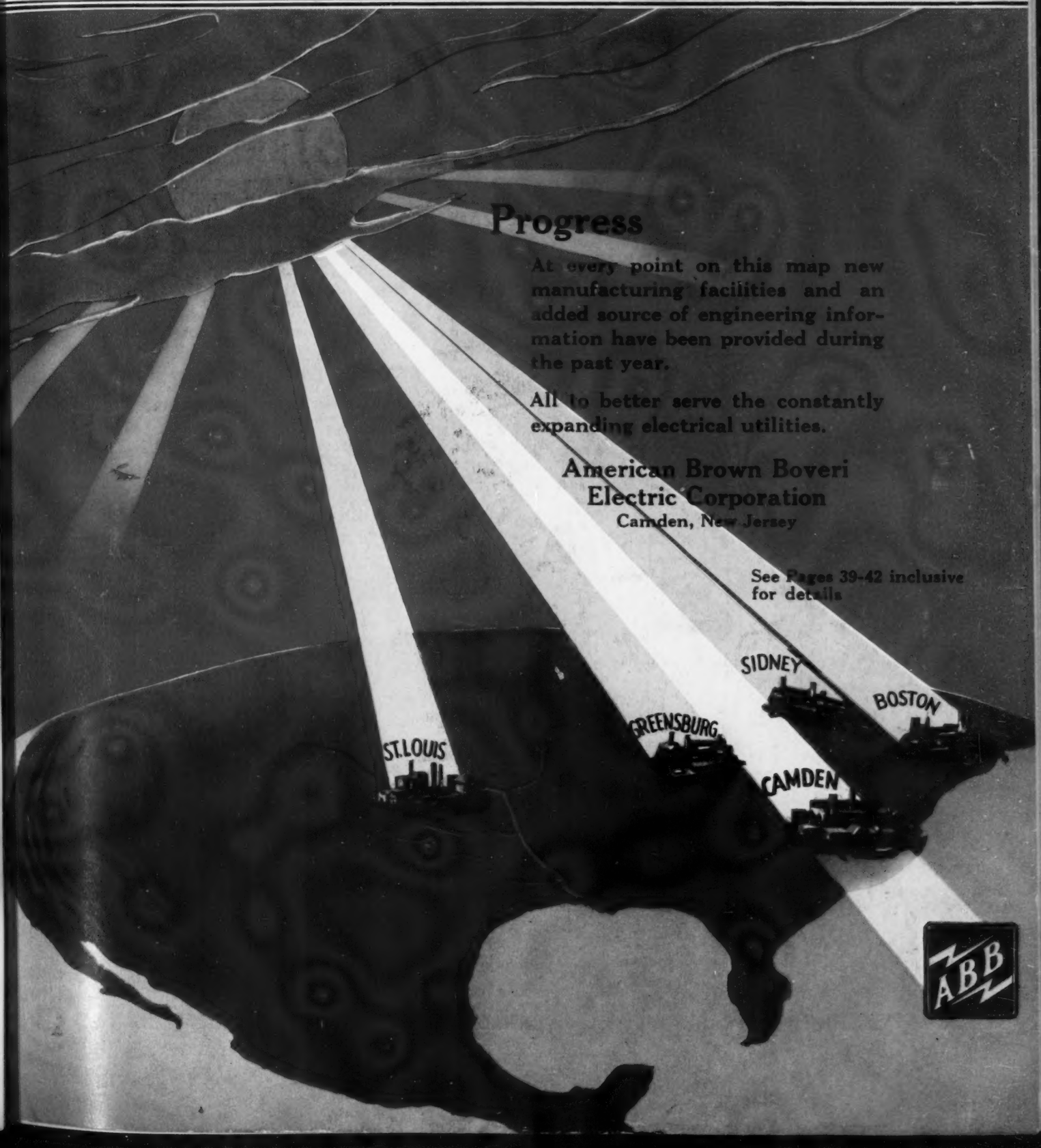
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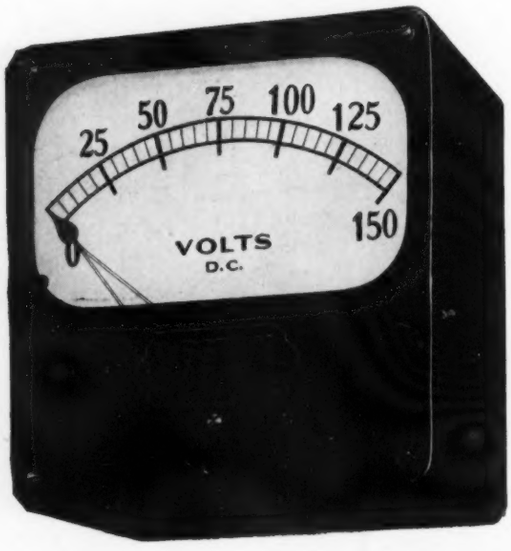

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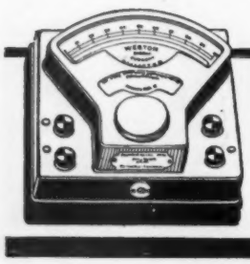

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Electrical World

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We Hate to Brag—But

LAST autumn, while material was being collected for the Annual Statistical Issue of the ELECTRICAL WORLD, it was necessary to predict certain statistics of the central-station industry for October, November and December, in order to make up an annual total. Only the totals were published, the estimated monthly figures being used merely as a means toward arriving at those totals.

Before the issue was published actual returns had been received against which the October estimates could be checked. Those for November and December had to be left for the future to justify.

The United States Geological Survey returns for certain of those items are now at hand. A comparison of the figures for energy generated is given below. The estimated total for the three months differs by less than 0.6 per cent from the amount as now reported. The difference affects the total for the year by 0.15 per cent.

Similar comparisons for the subdivision of the energy into that derived from hydro and that from fuel plants, as well as for fuel consumption, indicate that in no case were the totals for the year in error by as much as 0.5 per cent, except fuel oil.

The extraordinary increase in hydro-electric energy generated, as shown in our issue of last week, bringing the December output 20 per cent above that of December, 1925, could scarcely be foreseen, and accounts for slight overestimates of fuel consumption and of energy generated therefrom.

The substantial agreement in general, however, and the smallness of the percentage error in our yearly total indicates that the ELECTRICAL WORLD'S method of forecasting these operations is essentially reliable.

Kilowatt-Hours Generated

(Central Electric Light and Power Stations Only)

Month, 1926	E. W. Estimate	U.S.G.S.
October	6,270,000	6,174,959
November	6,074,000	6,053,635
December	6,310,000	6,326,857
Totals	18,654,000	18,555,451

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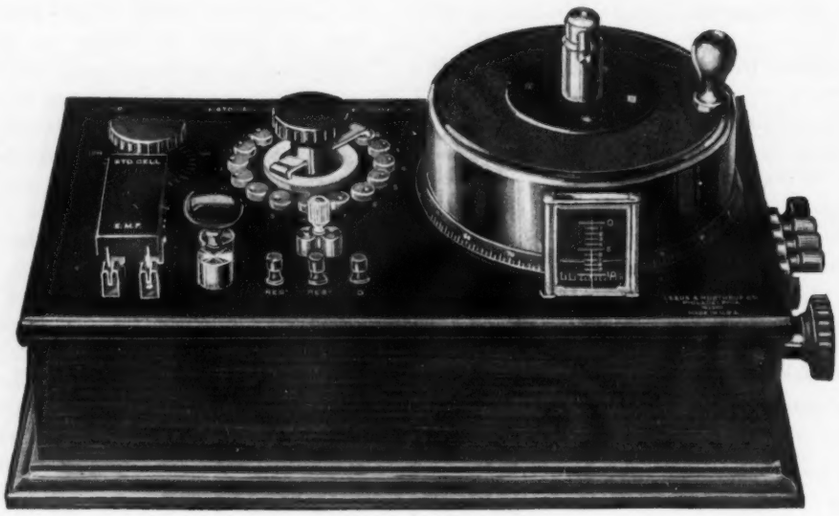

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Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 89 — *New York, Saturday, March 12, 1927* — NUMBER 11

Down with the Top Rate for Residence Business!

THE question of rates for residence service is of greater importance than most executives realize. More trouble is attributable to this cause than to any other. The demagogue particularly seizes on the top rates and compares them with low power rates or with the low domestic rates in force in service areas so fortunate as to be located near cheaply developed water power. No matter what the average rate may be, it is the top rate which receives the attention of rate agitators and serves to attract the attention of the public.

Without question high top rates can be justified; but from a public policy and common-sense business angle they should be modified. Were the electric light and power industry without experience, had Woolworth never lived or Ford never built automobiles, there might be excellent reason for hugging the high top rates. It is expedient, however, for many electric light and power companies to readjust their rate structures so as to encourage the use of electricity, and that can be best and most easily effected through a lower first-block rate. By and large, there need be no sacrifice of income. As a matter of fact, if the rate structure is properly devised, increased income will result. The all-important thing is to remove the targets at which the politicians shoot and which impede the proper development of residence business.

Convalescence of Two Stricken Leaders Hailed

THE many friends of Henry L. Doherty and of General Guy E. Tripp will be pleased to learn that, after having gone through a long siege of illness, both are well on the road to recovery. Mr. Doherty went to Battle Creek in the fall of last year for treatment and while in Washington in December determined to go to the Johns Hopkins Hospital in Baltimore for a thorough examination. There he is at present, convalescing from a nervous ailment, but very far from dead, as rumor had him last week. As one of the great thinkers and doers in the public utility business, the electrical industry would be greatly affected by his loss, which let us hope is yet a great way off.

General Tripp will soon leave the New York Hospital, where he underwent a serious abdominal operation. The manufacturing company over which he presides as well as the industry whose admiration and respect he has long enjoyed are naturally solicitous for his complete recovery. Leaders like Doherty and Tripp are not easily replaced; hence the satisfaction and joy the industry will feel in their complete restoration to health and vigor.

True Position of Water Power Becoming Clearer

SLOWLY but surely the true picture of the position of the water-power resources of the country in the field of power generation is emerging from the haze into which the unwise and overoptimistic propaganda of a score of years thrust the subject. The trend toward extensive steam-electric plant construction in California is a striking example of the change that is taking place. The public of today is still firmly of the opinion that electrical energy generated by water power is inherently low in cost and that the development of a water-power site means the solution of the problem of supplying electrical energy in its particular territory. Many organizations have rushed into the construction of hydro-electric plants only to find that the anticipated cheap energy fails to materialize. Others are facing the fact that rates based on the assumption that hydro-electric energy is cheap fail utterly to produce a showing on the balance sheet, in spite of the utmost care in operation.

It must not be assumed that all hydro-electric developments are unsound. This would be the other extreme of what has been a serious error on the part of the industry. Viewed in the light of careful and sober analysis, any hydro-electric development can hold its own only if the construction, including transmission line to market, can be carried out at a reasonable investment per kilowatt of firm power. If the available stream flow can be utilized only by the installation of three to four times the capacity available at times of minimum water flow, the steam-electric plant investment needed to stabilize the hydro-electric capacity may easily produce a total cost of energy which places a burden on the consumer greater than that of a steam plant adequate to supply all the power. It is not a temporary burden, but is likely to persist a long time in the form of higher rates than are really justified. Modern steam-plant economies are emphasizing the weakness of high investments in hydro-electric plants that must work at load factors half or less than half of those of steam plants.

The public relations problem which an erroneous idea of water-power economies has created is no small barrier to be overcome when agitation for water-power development appears in political guise. The present trend of energy costs from modern steam plants indicates the need of serious consideration of the problem in public relations which will appear when the public mind grasps the fact that steam-generated energy is the most desirable in many cases and insists that customers should not be called on to bear the expense of unwise hydro-electric developments. That this will occur when the politically minded friend of the people grasps the fact and turns it to his own political advantage is not improbable. The time to forestall it is now and not after the situation has been created.

Fractional-Horsepower-Motor Situation More Encouraging

REMARKABLE progress looking to the use of fractional-horsepower motors of higher power factor and efficiency on household appliances was made at the joint committee meeting of representatives of power companies and motor and appliance manufacturers held in Detroit last week. As an example of accomplishment through a truly co-operative spirit and mutual recognition of other men's problems the action of this committee is outstanding. In setting up and approving specifications which will improve the electrical characteristics of small motors used on such devices as refrigerators and oil burners it took a long step forward. The instigation of an investigation of conditions surrounding the use of intermittently operated motors, as in washing, ironing or vacuum-cleaner service, will no doubt result in acceptable recommendations for improvement.

With the solution of the fractional-horsepower-motor problem now apparently in sight it will be necessary for each of the groups interested—the utilities, the motor manufacturers and the makers of appliances—to see how far it can go to relieve any other single group from carrying most of the burden. As pointed out in the ELECTRICAL WORLD of July 10, 1926, power companies can rigidly police their distribution circuits to correct any conditions of low voltage, assume the task of educating customers to install more adequate wiring and avoid too rigid or unreasonable restrictions upon the starting currents of devices designed for operation from the lighting circuits. Motor manufacturers can devote their efforts most advantageously to designing motors having more desirable electrical characteristics at a minimum increase in cost. Appliance manufacturers can study the mechanical requirements of their machines with a view to making possible closer design of motors to meet a narrower range of power requirements.

The final answer to the problem must necessarily be found in compromises in which each interested group assumes its share of responsibility. Furthermore, in arriving at a final solution sight must not be lost of the fact that improvements in fractional-horsepower-motor application will be of distinct benefit to the public, and in the long run utility companies, motor manufacturers and appliance manufacturers will get the biggest return when they render the maximum service at a minimum cost.

Industrial Lighting Activity Is Timely

BETTER industrial lighting is a logical activity quite in harmony with the spirit of the times. This is a prosperous nation with a high level of working and living conditions. To maintain this standard and our present lead in productiveness we must eventually call upon every resource. The prevention of waste is one of the universally admitted needs of the present age. Increasing humanitarian interest on the part of industry demands the best in safety, comfort and hygienic welfare of workers. The latter are expected to give their best in return for the best in wages and in working conditions. Proper and adequate artificial lighting is a prominent feature in all these aspects of industrial production and working conditions. Poor lighting makes a worker less productive at a greater physical expense to him. It is wasteful and in the aggregate is costing this country hundreds of millions annually. It makes a factory a less desirable place to work in, and over the entire country it lowers the standard of working conditions to an appreciable degree.

Bearing in mind all these important points, it is gratifying that the industrial lighting committee of the National Electric Light Association has continued its last year's activity for another year. In fact, such an activity should go on until every factory in this country is supplied with the highest standard of lighting economically justifiable. Experiences of this committee continue to support the conclusions of investigators that the claims made for good lighting have as a rule been very conservative. Every lighting department man or specialist can go forth confident that on every hand direct or indirect economic value in the industries will accrue through his efforts in selling adequate and proper lighting.

Last year fifteen companies in the industrial lighting activity installed new lighting in more than five thousand factories, and the increased connected lighting load was about 25,000 kilowatts. Industrial lighting is an activity which, properly understood, should readily acquire the support of workers, employers, electrical interests, business organizations, civic groups, public officials and others. In this field the salesman can guarantee great returns to the purchaser.

Technical Solutions Not Always Economical

GREATLY increased range of transmission (even to transcontinental proportions), with stable operation, relatively constant voltage, opportunities for tapping lines at intermediate points, possibility of reversing power flow, simpler and cheaper generators, standardized transformer voltages and reduced insulation stresses and line losses, is the prospect held out by F. G. Baum in his recent patent (No. 1,617,007) assigned to the Westinghouse Electric & Manufacturing Company. As related on page 554, the results anticipated are to be secured primarily through connecting automatically controlled regulating condensers at intermediate points in the line (possibly every 100 miles), permitting line taps for supplying or receiving energy and giving the circuit the characteristics of a group of regulated short-section lines.

Because of Mr. Baum's experience and the Westinghouse company's recognition of his invention, the technical feasibility of the scheme will not meet the skepticism that most inventions while still in the paper stage arouse. Furthermore, a close counterpart can be found in any long high-voltage line linking a series of adjacent systems each of which has synchronous apparatus connected to the line, giving it the characteristics of a short-section line.

However, even if the technical feasibility of the invention be accepted by engineers after a thorough analysis, it still remains to be proved whether and when the scheme is economically feasible. With lines constructed and equipped as they are now, there is an economic limit (differing in each case) beyond which it is unprofitable to transmit power. Consequently, if expense per mile of line is increased, as appears necessary, with the proposed system, then offsetting monetary benefits

will have to be derived from it before the present economic ranges of transmission can be increased. W. S. Rugg, as quoted in our engineering pages, says that 75 per cent more line capacity can be obtained with this system at 20 per cent more expense than with normal transmission. Reliability of operation will also have to come in for consideration, particularly so with longer lines and the greater investments tied up. Can the system proposed offset the tendency for continuity of transmission service to be reduced in proportion to the exposure of the line—this depending on extent of connected circuits, number of line attachments, etc.? Experience with the existing counterpart—an interconnection trunk line—may afford a basis for comparison.

The system is interesting enough to command attention, but it will be unfortunate if the extensive newspaper publicity given to certain claims shall make the public believe that all the economic as well as technical problems involved in bringing unused water powers to both urban and rural communities at a greatly reduced price have been solved.

A Successful Refixturing Campaign

SURVEYS have convincingly shown that the average home is underlighted, that many sockets are without shades and that many fixtures are obsolete. Progressive central-station companies and contractor-dealers are trying or planning to cultivate this market. Utilizing the facts available and basing the campaign upon comfort and eyesight conservation by means of artistic fixtures equipped with shades, the Ohio Public Service Company has proved that "it can be done."

For the living room a five-lamp close-hung fixture was chosen and for the dining room a five-lamp chain-suspension shower. These were equipped with proper shades and lamps. They were displayed in showrooms amid proper settings and also in show windows. Salesmen carried properly equipped fixtures with them. To contractor-dealers were extended the same cost price and the privilege of displaying and selling the fixtures. Where the dealer sold the fixtures on the twelve-month payment plan the central-station company assumed the responsibility of collecting the payments. Much of the success of the campaign was due to harmony and cooperation between the company and the dealers. Quick delivery and installation was also a feature.

The campaign began as a thirty-day activity, but the results were such as to extend it indefinitely. In the first month approximately 3,400 fixtures were sold equipped with shades and for the most part with 50-watt lamps. In some cases 60-watt lamps were used in the living-room fixture. The connected load in lamps was doubled. In the living-room fixture an average of 140 watts was replaced by 250 to 300 watts. In the dining-room fixture an average of 125 watts was replaced by 250 watts. Besides these, 582 kitchen units were installed during the period of about one month.

This increase in wattage gives the consumer adequate lighting, and the shades provide proper lighting. The central station is well repaid in greater revenue, as has been shown in various cases cited in the ELECTRICAL WORLD. These refixtured rooms of the home are silent salesmen for better lighting throughout the home and the community. Such activities require effort to start them going, but they are needed for the proper development of an extensive available business. There is not a residential community in this country in which much better lighting is not needed. The reward repays the effort.

The Dealers Criticise the Power Companies

THERE is something of a tumult in the electrical appliance trade. Dealers, both electrical and non-electrical, are complaining with a strengthening chorus of opinion that the selling practices of central-station merchandising departments are unfair. The matter has not gone very far as yet, but there seems to be a lot of smoke arising. It would be well for utility executives to seek the fire and discover what is fueling it.

It does not take long to locate the blaze. Criticism is directed principally at the tendency among power companies to sell household equipment on terms that feature an exceedingly low "down" payment and installments that are spread over a very long period. For it is becoming standard practice among merchants who are dependent upon merchandising profits for their livelihood to secure from 25 to 33⅓ per cent cash down on easy-payment sales and to limit the installments to twelve months' time. The central stations, however, impelled by zeal to sell, are accepting often 10 per cent cash or less and taking contracts that frequently extend eighteen or twenty-four months or even longer.

The electrical dealers have long been chafing under this unmeetable competition. More recently there has been opposition on the part of some department stores and hardware dealers, which has had expression in a public attack on the utilities by the official organ of the hardware dealers' association. The situation has become a matter of active discussion in the industry, and the N.E.L.A. Commercial Section has appointed a committee on trade relations to study it.

It has been reported that action has been taken against the power companies in four states. Investigation does not bear this out, however. A letter of complaint addressed to one utility commission, and broadly published, as a matter of fact was never received by the commission. A bill introduced into the legislature of another state was voted down on the testimony of a preponderance of the dealers of the affected territory, who came to the support of the central-station company. There has been much exaggerated gossip involved as to what has actually occurred, but the cause remains an undisputed fact. The question is: Are these attenuated terms, these nominal "down" payments, economically sound? Are they really essential to the rapid sale of appliances?

The laws of credit are just as definite as the laws of electricity. Through long years of trade proven practices have evolved which are accepted broadly throughout industry and commerce. In this field of merchandising the power companies are, of course, amateurs. Is it wise, is it safe, therefore, to override standard practice in such a matter as easy-payment terms, without a very careful study of the effect on the other merchants who are helping in the building of this market? There is no place for an attitude of "Trade be damned!" in the development of popular demand for electricity in the home. The need is for more strong, prosperous, friendly dealers of all kinds.

Walter Scott Wyman

A builder of public utilities, a pioneer in hydro-electric development and a leader in engineering service for the common good.

AMONG the leaders of the electric light and power industry are not a few men whose work in its upbuilding has been carried on with so little personal publicity that the value of their services is still far from realized by the average citizen and even by many men in the electrical industry. Men of this type prefer to let their constructive achievements speak for them. Such a man is Walter S. Wyman, president of the Central Maine Power Company, to whom the Pine Tree State owes unusual recognition because his vision, courage and leadership have contributed so greatly to the common good.

Mr. Wyman was born at Oakland, Me., May 6, 1874. He was among the first students of electrical engineering at Tufts College, and after a brief experience in the waterworks field he was elected in 1899 general manager of the Waterville & Fairfield Railway & Light Company in Maine. In June, 1901, with Harvey D. Eaton he formed the Messalonskee Electric Company and began to develop hydro-electric power on a considerable scale for those days in the Waterville district. Later the company's name was changed to the Central Maine Power Company. It grew rapidly to its present dimensions, under the personal direction of Mr. Wyman, aided by a loyal and competent staff. To a rare degree he has been responsible for the engineering, commercial and financial activities of the company for nearly a generation.

When the Middle West Utilities Company acquired control of the Central Maine company about two years ago, Mr. Wyman was the logical man to head the New England Public Service Company, which was formed to hold the northern New England properties of the Insull organization.

Mr. Wyman was made general manager of the Adirondack Power & Light Corporation in 1917 and carried on this work in addition to that in Maine during the stress of the war period, besides promoting the Adirondack and Mohawk Edison consolidation and being chairman of the district exemption board for western Maine. Nine hydro-electric plant developments, costing more than $8,000,000, have been made under his direction in Maine during the past eleven years. Mr. Wyman is at present active in seeking to obtain legislation under which surplus hydro-electric power may be exported from that state. He is a past-president of the New England Division, N.E.L.A., and a fellow of the A.I.E.E.

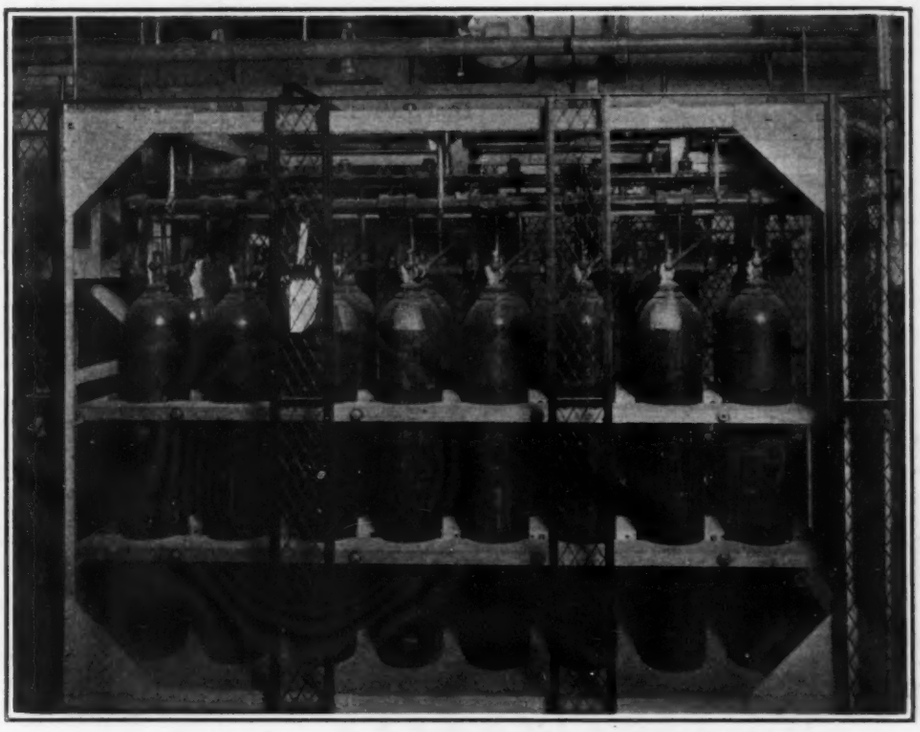
Generator Fire-Extinguishing System at Edgar Station

Multi-Cylinder Installation Employs Liquid CO_2 Under 850 Lb. Pressure—Tests Show a 20 Per Cent Content Can Be Obtained in Fifteen Seconds—Excess Gas Content Desirable Precaution Against Air Leakage

By GEORGE R. DAVISON
Edison Electric Illuminating Company of Boston

WHEN the closed system of ventilation for generators came into use, the problem of dealing with fires in such equipment was simplified. Combustion cannot spread in an atmosphere containing an insufficient amount of oxygen. Acting on this principle, carbon-dioxide gas has been found very effective in smothering fires in confined spaces.

About five years ago an installation in which carbon-dioxide gas was stored in a tank for the protection of a 20,000-kw. generator was made at the South Meadow station of the Hartford Electric Light Company. Tests on this equipment indicated its effectiveness for the purpose (ELECTRICAL WORLD, Nov. 18, 1922, page 1089). In connection with the construction of the Edgar station of the Boston company, it appeared that storage of carbon dioxide in the liquid state would be a distinct advantage, and a practical advance was realized when a nozzle was developed by manufacturers in which the liquid gas could be expanded to atmospheric pressure without freezing and interfering with the flow. With this came proper mechanism for releasing the CO_2 in large quantities quickly and at a point remote from the cylinder. These improvements led to an installation of "Lux" liquid carbon-dioxide gas equipment in connection with the two initial units contemplated for the Edgar station. The accompanying diagram indicates how the system was piped to the two main and auxiliary generators.



BATTERY OF LIQUID CO_2 CYLINDERS FOR PRIMARY AND SECONDARY USE

The installation consists of eighteen cylinders, each containing 50 lb. of liquid gas under 850 lb. pressure at 70 deg. F., arranged to take care of two main 30,000-kw. generators and two auxiliary 2,000-kw. generators. Each cylinder is sealed by a gas-tight copper disk designed to be pierced by a cutter valve for releasing the gas. The valves on eight cylinders are released in unison through a connecting rod, which may be operated manually but which is arranged to be actuated automatically by means of a falling weight that is normally suspended from a latch. The latch is operated by an electric relay, which drops the weight and releases the eight cylinders on a primary discharge to one of the main generators. The valves on the other eight cylinders are geared to trip one at a time at proper intervals by means of a motor-driven cam system to supply the ventilating system with carbon dioxide when dilution by leakage of air into the machine occurs during the deceleration period.

Two additional cylinders complete the equipment, these being arranged for simultaneous discharge to either of the auxiliary generators.

The piping system for the main generators consists of two lines, one for the initial charge of gas and a small line for secondary supply. These lines end in distributing branches in the generator ventilating system and discharge directly into the intakes to the generator windings.

For the auxiliary generators a similar system is employed using a single piping system.

The system is equipped with automatically operated selector valves placed to direct the flow to one or the other generating units. These valves are of the same type as the gas-release valves, but are larger. They are located near the gas cylinders and are properly protected by a cage.

The controls for putting the system into operation are Payne Dean switches. The switch used in connection with each main generator is located on the turbine room floor at the corresponding turbine gage board, and at these points are also located the control switches governing the equipment for the corresponding auxiliary generators. These switches are designed for actuation from the generator balanced protection relays, but are not yet so connected.

When the fire-extinguishing system on one of the main generators is tripped, various operations take place in the following order: First, the selector valves are opened in the lines that conduct the primary and secondary discharges to the desired generator. The valves on the eight primary cylinders are then simultaneously operated, and finally the motor is energized for the operation of the delayed cylinder charges.

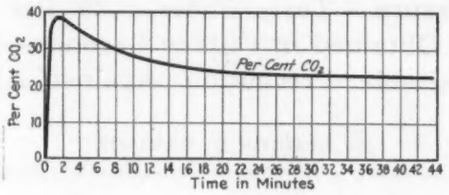
Similarly, when the control is tripped for one of the auxiliary generators, the selector valve and the cylinder valve operate in proper direction and sequence.

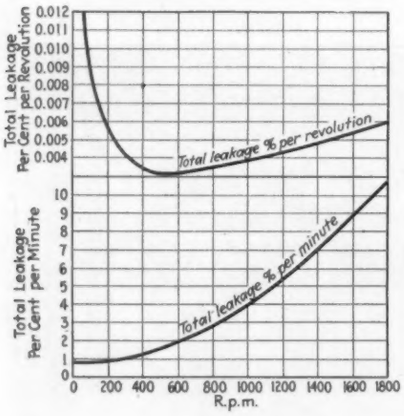
The equipment as set up at the station is illustrated. As in the Duquesne Light Company substation installation (ELECTRICAL WORLD, May 15, 1926, page 1059), the cylinders are mounted on a platform scale to furnish a means for detecting any undue leakage from them.

Several tests were made upon the apparatus, and some curves are given illustrating the results. The chart shows the condition of air in the ventilating system from samples taken at a point immediately below the rotor and above the coolers at various intervals of time after closing the throttle and simultaneously discharging the initial eight cylinders into the ventilating system of main generator No. 2. The initial pressure rose to 1.75 in. of water, and the relief doors were observed to open slightly. It will be noted that the maximum condition was reached in one minute and 45 seconds. This delay was partly due to the fact that the valves were operated by hand during the tests. This is intended to be accomplished later by falling weights. Two more charts give the results during deceleration of the generators when simultaneously discharging the eight initial cylinders at the instant of closing the throttle. The relief doors opened for several seconds on the test and the maximum pressure in the duct did not exceed 3½ in. of water.

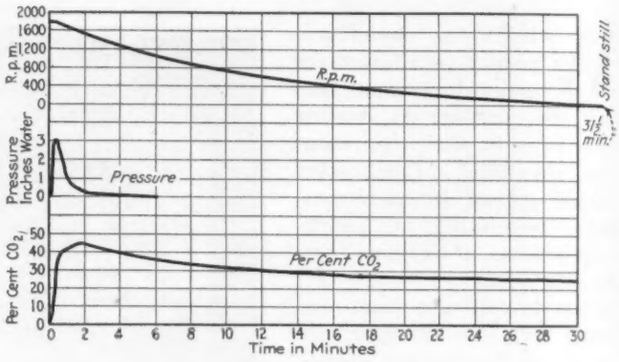
These latter curves give the data for calculating the periodic release of the secondary cylinders for compensating leakage. It will be noted that the time interval of the delayed discharge varies with the speed.

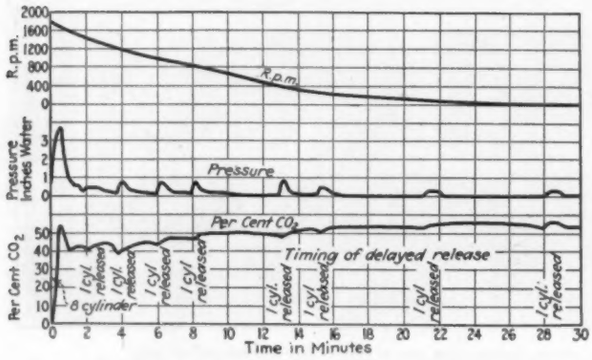
Another chart shows the results of discharging the eight initial cylinders and the eight delayed cylinders during deceleration of the unit, starting at the instant of closing the throttle. The setting of the cams for the time interval of the delayed cylinders was made in accordance with the data given by the chart of leakages per revolution and per minute.

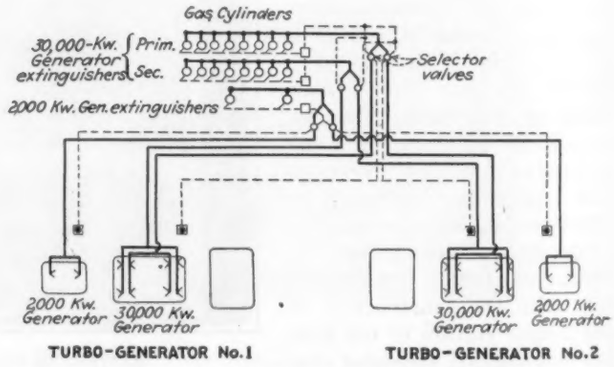



Total Leakage Per Cent per Revolution
Total leakage % per revolution
Total Leakage Per Cent per Minute
Total leakage % per minute
R.p.m.

Test Results with CO_2 Protection of Turbo-Generators







Top—Condition which prevails with simultaneous discharge of eight cylinders.

Upper left—Leakages per revolution and per minute computed from discharge tests where the sequence of delayed releases was not employed.

Upper right—Rate of CO_2 release during deceleration of generator.

Lower left—Discharging eight cylinders initially and eight in delayed sequence.

Lower right—Control piping and wiring for liquid CO_2 system.

The relief doors opened slightly upon initial discharge during the test. The curve plainly shows the effect of discharging each delayed cylinder. It will be noted that the curve rises slightly toward the end. This was due to the fact that the machine came to a stop in 28 minutes, whereas during the test from which the period of delayed charge was calculated it came to a stop in 31 minutes.

Pressure within the ventilating system did not exceed 3.7 in. of water during the test.

It will be noted that a 20 per cent carbon-dioxide concentration was obtained in fifteen seconds from start, indicating how quickly the danger to the machine can be stopped.

Definite knowledge has been obtained showing that air diluted by 25 per cent inert gas will smother fires. It will be noted that the percentage of carbon-dioxide gas throughout the period was above 40 per cent. It is well, however, to have a substantial excess of the gas content in order to provide against leakage from unforeseen causes. The results furthermore indicate that leakage from the machine under test is very small.

One hour and five minutes after the machine had stopped rotating the concentration in the ventilating system was 34 per cent. It is a desirable feature that this concentration can be retained, for it permits the dissipation of heat at any existing hot spot without danger of rekindling the fire.

The system was designed by Walter Kidde & Company, Inc., New York City.

Rapid Calculation of Rate Curves

A Short-Cut Method Proposed Which Is Intended to Reduce Rate Curve Calculation Largely to Mental Arithmetic

BY H. E. EISENMENGER
New York City

WHERE the hyperbolic scale paper[1] is not available or where very great accuracy is desired, the ordinary and obvious method for figuring block-rate curves (cents per kilowatt-hour against kilowatt-hours) is generally used, which employs two successive steps. First the amounts of the bills in cents or dollars charged for a certain selected number of kilowatt-hours—for instance, for every multiple of 100 kw.-hr.—are figured and then the amounts thus obtained are divided by the respective number of kilowatt-hours. This is exemplified by Table I, which shows the method of computation of a limited number of points of the rate curve for the following block rate:

1st block —	first 500 kw.-hr. at	10 cents	0 to 500 kw.-hr. block
2d block —	next 500 kw.-hr. at	8 cents	500 to 1,000 kw.-hr. block
3d block —	next 1,500 kw.-hr. at	7 cents	1,000 to 2,500 kw.-hr. block
4th block —	excess over 2,500 kw.-hr. at	6 cents	2,500 and over kw.-hr. block

In the following a rapid "lightning calculation" method will be shown that leaves out the intermediate step of calculating the total bill—that is, the second column in Table I.

The amount of the monthly bill a in cents under a block rate can always be reduced to the formula[2] $a = C + se$, where e is the total number of kilowatt-hours used by the consumer during the month. C is a constant that changes from block to block—it is zero in the first block and increases with every following block—and s is the kilowatt-hour charge made in the respective block in cents per kilowatt-hour.

In the block rate shown herewith the constant C is figured, for example, in the following manner[2] by expressing algebraically the ordinary way of figuring the amount:

TABLE I—OLD METHOD OF COMPUTATION OF POINTS OF A RATE CURVE FOR A GIVEN BLOCK SCHEDULE

Kw.-Hr.			Bill in Cents		Kw-Hr.		Cents Per Kw.-Hr.
500	at 10 cents	=	5,000	÷	500	=	10.000
100	at 8 cents	=	+800				
600			5,800	÷	600	=	9.667
100	at 8 cents	=	+800				
700			6,600	÷	700	=	9.429
100	at 8 cents	=	+800				
800			7,400	÷	800	=	9.250
100	at 8 cents	=	+800				
900			8,200	÷	900	=	9.111
100	at 8 cents	=	+800				
1,000			9,000	÷	1,000	=	9.000
100	at 7 cents	=	+700				
1,100			9,700	÷	1,100	=	8.818
100	at 7 cents	=	+700				
1,200			10,400	÷	1,200	=	8.667
100	at 7 cents	=	+700				
1,300			11,100	÷	1,300	=	8.538
	* *		* * *		* * *		
2,500			19,500	÷	2,500	=	7.800
100	at 6 cents	=	600				
2,600			20,100	÷	2,600	=	7.731
200	at 6 cents	=	1,200				
2,800	and so on.		21,300	÷	2,800	=	7.607

Second Block: a = 10 cents per kilowatt-hour × 500 kilowatt-hour + 8 cents per kilowatt-hour × (e — 500 kilowatt-hour)
= (10 — 8) 500 + 8e = 1,000 cents + 8e
C_2 = 1,000 cents, s = 8 cents per kilowatt-hour

Third Block: a = C_2 + (8 cents per kilowatt-hour × 1,000 kilowatt-hour) + 7 cents per kilowatt-hour (e — 1,000 kilowatt-hour)
= 1,000 cents + (8 cents per kilowatt-hour — 7 cents per kilowatt-hour), 1,000 kilowatt-hour + 7e
= 2,000 + 7e
C_3 = 2,000 cents, s = 7 cents per kilowatt-hour

Fourth Block: a = C_3 + 7 × 2,500 + 6 (e — 2,500)
= 2,000 + (7 — 6) 2,500 + 6e
= 4,500 + 6e
C_4 = 4,500 cents, s = 6 cents per kilowatt-hour

What we are interested in here is not the monthly bill, but the average charge per kilowatt-hour in cents per kilowatt-hour, to be called $y = \frac{a}{e}$

We get for the first block $y = 10$

We get for the second block $y = \frac{1{,}000}{e} + 8$

We get for the third block $y = \frac{2{,}000}{e} + 7$

We get for the fourth block $y = \frac{4{,}500}{e} + 6$

These formulas furnish a means of direct and very rapid calculation of the cents per kilowatt-hour. No intermediate steps of calculation are necessary and the cents per kilowatt-hour can be written out with surprising speed directly beside the column of the kilowatt-hours.

[1] See H. E. Eisenmenger, "Straight Lines as Rate Curves," ELECTRICAL WORLD, June 2, 1923.

[2] See H. E. Eisenmenger, "Central Station Rates in Theory and Practice," Fred J. Drake & Company, Chicago, Appendix XII, pp. 355 to 356.

TABLE II—DETERMINATION OF POINTS HAVING ROUND FIGURES FOR CENTS PER KILOWATT-HOUR VALUE

e in kilowatt-hours	$y = \frac{1{,}000}{e} + 8$
	Cents per kilowatt-hour
$= \frac{1}{2} \times 1{,}000 = 666\frac{2}{3}$	$y = \frac{3}{2} + 8 = 9.5$
$e = \frac{1}{3} \times 1{,}000 = 750$	$y = \frac{4}{3} + 8 = 9\frac{1}{3}$
$e = \frac{1}{4} \times 1{,}000 = 800$	$y = \frac{5}{4} + 8 = 9\frac{1}{4}$
$e = \frac{1}{5} \times 1{,}000 = 833\frac{1}{3}$	$y = \frac{6}{5} + 8 = 9.2$
$e = \frac{1}{8} \times 1{,}000 = 888\frac{8}{9}$	$y = \frac{9}{8} + 8 = 9\frac{1}{8}$

and so on.

The method lends itself also readily to picking out at one glance those numbers of kilowatt-hours for which the average cents per kilowatt-hour charge, y, is a round figure, which term is meant to designate that the kilowatt-hour figure ends either with a whole number of tenths or with a simple fraction, like $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, etc. These points have the double advantage that they can be figured by mental arithmetic alone, and that they are easily plotted.

Thus, for instance, the points in the second block of the above rate are found in Table II.

We can thus work out practically the whole block by mental arithmetic alone.

Since a multiplication is more easily and rapidly carried out than a division, both on the calculating machine or with pencil and paper, the use of a table of reciprocals from an engineering handbook, etc., is strongly recommended. Thus, for instance, the cents per kilowatt-hour at 1,700 kw.-hr. (third block) are calculated as:

$$\frac{2{,}000}{1{,}700} + 7 = 2 \times \frac{1}{1.7} + 7 = 2 \times 0.5883 + 7 = 8.177 \text{ cents per kilowatt-hour.}$$

A calculating machine will in every case produce the result in a single operation, since the summation with s can always be easily made mentally, because s always is a simple figure.

As a check, it is advisable to figure out the cents per kilowatt-hour for every limiting amount of energy between two adjoining blocks in two ways—that is, by the formulas belonging to both adjoining blocks—which of course must give the same result. Thus the cents per kilowatt-hour for 2,500 kw.-hr. (limit between third and fourth blocks must be $\frac{2{,}000}{2{,}500} + 7 = 7.8$ cents, if figured after the formula of the third block, or $\frac{4{,}500}{2{,}500} + 6 = \frac{9}{5} + 6 = 7.8$ cents, after the formula of the fourth block.

If no calculating machine is available, computation by logarithms (if preferred) offers special advantages in this case which are too obvious to need explanation.

The same method can also be employed for other than pure block rates, load factor curves, etc.

Electric Power in Switzerland

LACK of a domestic fuel supply and an abundance of water power have combined to make Switzerland a most conspicuous user of electrical energy, one greatly exceeding the United States in her output per capita. Virtually all of it is hydro-electric, about one-sixth of the product being exported and bringing in a national revenue exceeding $2,500,000. This is a considerable item for a nation which, according to the 1920 census, has only 3,880,320 people. Statistics recently published are summarized in the accompanying tables.

TABLE I—INSTALLED CAPACITY IN METRIC HORSEPOWER AT END OF YEAR*

	1924		1925	
	Horse-power	Per Cent	Horse-power	Per Cent
Private undertakings	754,000	48	850,000	46
Cantonal and mixed	399,500	25	483,000	26
Municipal	233,600	15	322,000	17
Federal railways	183,500	12	195,000	11
Total installation	1,570,600	100	1,850,000	100

* In 1914 the installed capacity was about 526,000 metric hp. The unit is 1.6 per cent smaller than the English horsepower.

TABLE II—DISTRIBUTION OF ENERGY CONSUMPTION*

Consumption for	1923		1924	
	Millions of Kw.-Hr.	Per Cent	Millions of Kw.-Hr.	Per Cent
Light, heat, power	1,682	55.0	1,988	57.4
Electrochemistry and electrometallurgy	580	18.9	570	16.5
Export	521	17.0	567	16.3
Railway operation	280	9.1	340	9.8
Total	3,063	100	3,465	100

* The estimated output in 1925 was 4,170,000,000 kw.-hr.

TABLE III—ENERGY EXPORTED AND REVENUE FOR EXPORTED ENERGY*

Year	Energy Exported		Revenue	
	Millions of Kw.-Hr.	Per Cent of Total Output	Millions of Francs	Centimes per Kw.-Hr.
1920	377	12	6.3	1.67
1921	328	11	6.7	2.04
1922	463	15	10.0	2.16
1923	522	17	12.7	2.44
1924	567	16	13.0	2.30
1925	655	16*	13.6	2.08

*Based on estimated total output.

TABLE IV—OUTPUT BY VARIOUS TYPES OF ESTABLISHMENTS

Type of Establishment	1916		1924	
	Millions of Kw.-Hr.	Per Cent	Millions of Kw.-Hr.	Per Cent
Private undertakings	519	37.7	1,881	54.3
Cantonal and mixed	490	35.7	848	24.5
Municipal	367	26.6	564	16.2
Federal railways	....	.....	172	5
Total output	1,376	100	3,465	100

TABLE V—CAPITALIZATION OF SWISS ELECTRIC CENTRAL-STATION INDUSTRY*

End of Year	Capital Stock	Funded Debt	Total Capitalization
	Thousands of Francs		
1905	74,504	137,964	212,468
1909	121,192	209,495	330,687
1914	185,403	311,882	497,285
1922	341,316	577,193	918,509
1924	1,132,000		1,132,000
1925†	1,300,000		1,300,000

*Allowing 10 per cent additional for floating debt and another 15 per cent set aside for amortization brings the total capital tied up in the industry at the end of 1925 to some 1,600,000,000 francs, or in round numbers $300,000,000.
† Partly estimated.

Demonstration of Highway Illumination

Description of an Experimental Installation of Highway Lighting —Advantages of the Unit Adopted Enumerated and Details of Equipment Erection Included

By FRANK C. TAYLOR
Assistant Manager Industrial Sales Department
Rochester Gas & Electric Corporation

TO DEMONSTRATE what good highway illumination embodies and what it will do, the Empire State Gas and Electric Association some time ago interested its member companies in the proposition of making highway-lighting demonstration installations. Last fall the Rochester Gas & Electric Corporation selected a section of the Buffalo highway extending 7.3 miles west of Canandaigua to Bloomfield as a main trunk highway where proper illumination would demonstrate best what adequate highway lighting means. This section had no electric service; consequently, it was possible to start clean without any interference with existing poles or lines.

Consideration was given to three types of illumination, as follows: First, special highway units spaced 350 to 400 ft. apart; second, 200-cp. Eternalite units spaced 125 ft. apart; and last, 400-cp. Eternalite units which are spaced 250 ft. apart.

ILLUMINATED HIGHWAY, SHOWING VISIBILITY QUALITIES. CAR IS 625 FT. AHEAD OF CAMERA

From the general experience of this company with highway illumination and from recent experiments with Eternalite units on Chili Road (a road quite similar to the Canandaigua section) it was decided to install 400-cp. frosted lamps on 10-ft. cranes on poles spaced 250 ft. apart on one side of the road. The reasons for this decision were as follows:

1. It was desired to standardize on a unit that could take a 200 or 400-cp. lamp and that would be flexible in use as the requirements for illumination varied.

2. The unit selected will take a 200 or 400-cp. lamp.

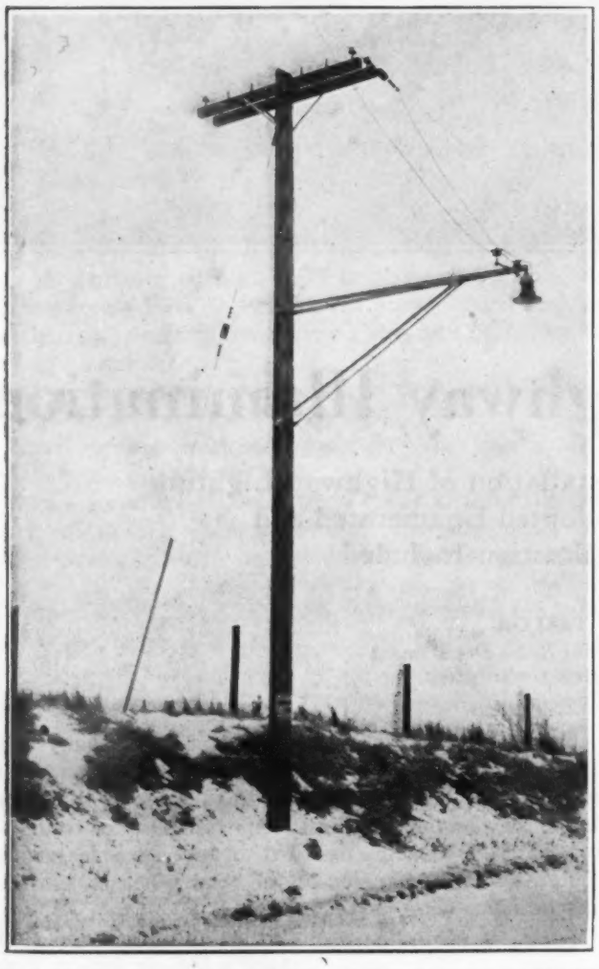
3. It is now in use extensively by the company in village, town and city illumination. Hence its use on a trunk highway would mean no change in unit type when the lighted highway passed through a village or town. In brief, the use of this unit for highway lighting would mean simply an extension

of the present lighting with perhaps a change in size of lamp or spacing.

4. The unit is rugged and practically indestructible.

5. It is easily cleaned.

6. It sends the light along the road and on both sides. In regard to this feature there is a great difference of opinion, yet it was felt that although for highway illumination alone a unit with a bilateral distribution might be more efficient, side-of-the-road or farm illumination had a value, since driveways, crossroads, signs and farmhouses should receive some illumination. If the light were restricted to the highway alone, the



ARM CARRYING LIGHTING UNIT IS SUPPORTED FROM BENEATH, CLEARING POLE TOP FOR WIRES

owners of farms along the road would not have the police protection of city lights, neither would the crossroads and driveways be sufficiently illuminated for complete vision by the drivers on the highways.

7. This unit has no glass other than the lamp bulb. This feature seemed especially desirable, since globe or glass breakage, due to hunters or children, is not only an expense but also a great inconvenience and a feature tending to lamp outage. The lamp bulb itself is much less likely to be hit than a large globe or sheet of glass.

The system of illumination suits the particular conditions imposed by the character of the road and so lights it that it is possible to drive practically as fast at night as during the day, with equal safety.

As a result of what information could be gathered on mounting height and from experiments, a 10-ft. crane was selected and placed on the pole with its end 20 ft. from the surface of the road, making the height of the lamp from the road approximately 18 ft. 6 in. Where the contour of the roadside required taller poles to give the required lamp-mounting height, they were installed. Except in unusual locations, 30-ft. cedar poles were used throughout the 7.3 miles of highway.

In order to save pole height the supporting arms were placed below the crane rather than above, which left the top section of the pole free for wires and saved about 5 ft. in pole height.

To reduce glare, full-frosted 400-cp. lamps were used throughout. This feature cannot be overemphasized, since experiments show that even with 200-cp. bare lamps the glare is quite distressing.

The use of 400-cp. lamps with 250-ft. spacing may seem to be unnecessary, but to those who have seen this installation and compared it with 200-cp. lamps 250 ft. apart, it is evident that the increased candlepower is well warranted. Further consideration shows that over half the annual expense consists of items independent of the size of the lamps installed; consequently increasing the candlepower increases only slightly the annual cost.

On the Canandaigua Highway it is easy to distinguish the outline of the rear of an auto more than 1,200 ft. ahead. The absence of glare and the illumination of the side of the road, together with the visibility of all objects or obstructions on the road, make night driving a pleasure.

It was interesting to observe how little approaching headlights trouble driving. On the highway without illumination the headlights blind, but with adequate highway illumination the light background so reduces the contrast between the headlights and their background that the glare no longer appears blinding.

Conversation with one of the farm owners along this road brought out two of the main arguments in favor of highway lighting. This man said that he had owned his farm for seven years but had not received an offer for it until the highway lights had been turned on. He further said that one of the farmers had been troubled by chicken thieves, but now he figured that a thief would hesitate before driving down the lighted road and entering his grounds under the road lights.

VALUE OF PROPER HIGHWAY LIGHTING

1. Increases the value of adjacent property.
2. Gives police protection.
3. Decreases accidents.
4. Increases night driving.
5. Increases the capacity of roads by increasing the safe driving speed during the hours of darkness, thus encouraging night driving.
6. Decreases the isolation of the farm by making walking from farm to farm safe at night.
7. Decreases to a negligible point the irritation and hazard of approaching glaring headlights.
8. Gives confidence and pleasure to the automobile driver at night, for he no longer is dazzled by headlights, nor is he wondering constantly what is ahead of the limited range of his legal headlights.
9. Electricity for home and farm use follows along the poles used for highway lights, making possible for the farms the electric appliances which the city dweller enjoys.

This demonstration of highway lighting was installed by the Rochester Gas & Electric Corporation and sponsored by the town of Bloomfield, the Rochester Automobile Club, the New York State Highway Association and the New York State Grange.

Big Opportunities in Relighting the Home

Experience of Ohio Public Service Company in Test Campaign Shows It Possible to Double Wattage of Principal Rooms—Sale of 3,395 Fixtures Adds 1,108 Kw. to Residence Load

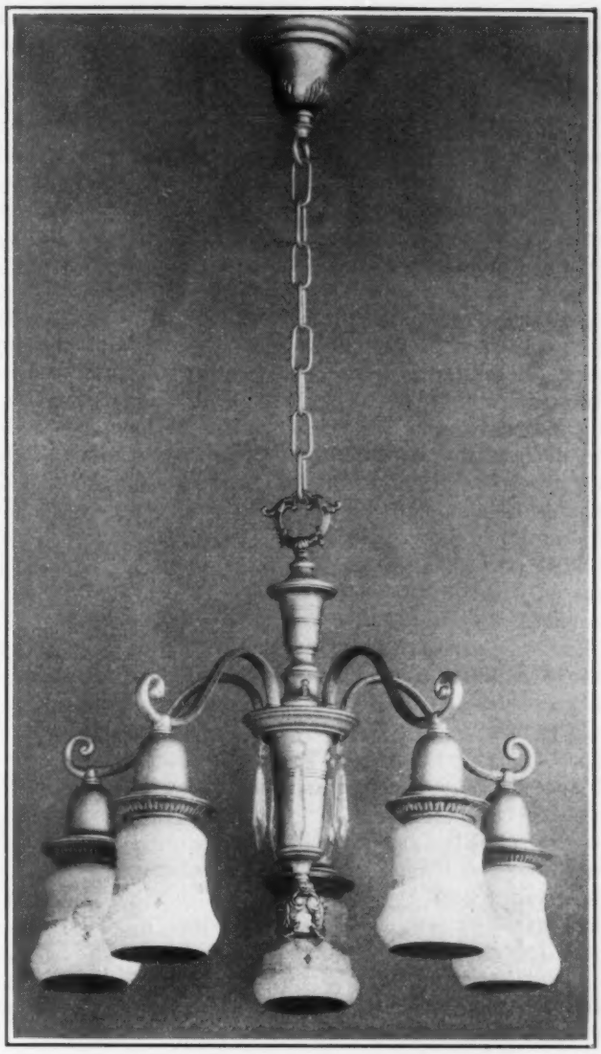
By C. L. DUNN
Chairman Home Lighting Committee, N.E.L.A., General New-Business Manager Ohio Public Service Company, Cleveland, Ohio

INADEQUACY of the present lighting equipment in the home presents a large and lucrative field for the sale of new equipment to replace obsolete fixtures, raise the wattage of lamps per room and increase residential customers' use of energy for lighting. Recent surveys show that 31 per cent of all ceiling fixtures are obsolete and that because of the low-wattage lamps installed the average home has barely half enough light. A study of the market for new lighting equipment to replace obsolete fixtures in old homes and the probable rate of replacement leads those who attempt to analyze the situation to believe that a constructive and commercially successful program should be considered in terms of a five-year schedule, featured once each year by some special sales effort.

The plans of the N.E.L.A. home lighting committee call for very definite activity between now and the end of 1927 under a schedule that provides, first, for several months' test work and experience; second, for the publication of a prospectus and plan book in March; third, for the preparation and co-ordination of the effort of individual member companies in September, and fourth, for the operation of a number of individual relighting activities in October, so that by reason of the cumulative effect and the advertising of lighting equipment manufacturers the work of the committee will be made national in scope and character.

To determine from actual experience the most practicable sales methods for raising the standard of home lighting several test campaigns have been undertaken in different sections of the country. One of these test activities that is being watched with keen interest because it embodies a number of comparatively new features in sales approach is that of the Ohio Public Service Company, of which T. O. Kennedy is vice-president and general manager.

In a period of 29 working days the quota of 2,000 living-room and dining-room units was exceeded by 70 per cent, and as a byproduct of the effort a number of fixtures have been sold for other rooms in the home,



TYPICAL DINING-ROOM UNIT USED IN REFIXTURING CAMPAIGN

principally the bedroom and kitchen. In addition to 3,395 fixtures, 582 kitchen units were sold, in spite of the fact that an intensive ten-day selling campaign on these same units had been concluded a few weeks previous, during which 1,603 kitchen units were sold. None of the figures given here includes fixtures that are out on trial installation, actual sales only being given. Indications are that less than 10 per cent of cancellations on these will be encountered.

This has been accomplished in a group of properties serving approximately 60,000 residence meters by a selling organization of approximately 75 men.

Another byproduct of this effort was the sale of a number of Mazda lamps to fill empty sockets and replace burned-out lamps or lamps of lower wattages. The total lamp wattage sold, including that sold in fixtures, was 1,108,845 for the first 25 working days, or approximately 22,000 lamps.

Excluding the kitchen units, slightly more than half of the total fixtures sold were the two that were featured in the activity, one for the living room and one for the dining room. The living-room fixture was a five-light, close-hung, shower type with glass shades. The dining-room fixture was a five-light, chain-suspension body and arm, shower type with glass shades. Both of these fixtures were equipped with 50-watt new

inside-frosted lamps. In a few instances 60-watt lamps were used in the living-room fixture.

The experience of the Ohio Public Service Company would indicate that it is not necessary for a utility company to stock a large variety of fixtures. Sales can readily be cared for with from three to five types of fixtures. It is essential, however, to be prepared to allow some customers to purchase alternative fixtures, when objections to the featured fixture cannot be overcome by the salesman.

Such situations may be handled in either of two ways. First, the utility may stock small quantities of from three to five designs to meet style objections, and second, arrangements may be made with fixture dealers for samples of other designs on consignment for display purposes, sales of these designs to be made from the dealers' stocks during this special activity. This latter method permits the utility to enjoy all of the benefits of a widely diversified line without the necessity of carrying any investment in stocks and may be handled in such a manner that much good will is created with the trade, the hearty co-operation of which should prove mutually helpful.

Early in August a letter was sent to a number of fixture manufacturers inviting them to submit sample fixtures—one each for a living room and a dining room—to be sold to the customer at a price not to exceed $25. These fixtures were to be manufactured to a set of specifications similar to those later prepared by a joint committee of the Illuminating Engineering Society and the Edison Association of Illuminating Companies, which cover three principal subjects: First, the appearance of the fixture both lighted and unlighted; second, the mechanical and electrical qualities, and third, the ability of the fixture to do a good lighting job.

About one month later ten manufacturers displayed their fixtures individually before a group of a hundred salesmen and executives of the Ohio Public Service Company. These fixtures were rated according to the specifications by each of the hundred men, and the fixtures that received the highest rating by the group were selected for the activity. This method of selection was later capitalized by telling prospective customers that the fixtures had been selected by a hundred men as those that best met the requirements necessary to render efficient illumination.

Sales Organization

The selling organization in each property consisted of a sales manager, a territory salesman for each 1,200 customers and several specialty salesmen. In the case of any 30-day activity on a particular appliance or piece of lighting equipment it is customary to require that all salesmen spend practically their entire time in promoting the sale of this merchandise. In this lighting activity all members of the sales department participated on an equal basis of commission. The territory salesmen were restricted to operation in their own territory, whereas the specialty men worked anywhere on the lines of the property to which they were attached.

As might be expected, the specialty salesmen on refixturing generally sold more lighting equipment than any individual territory man. Progress reports also indicate that other specialty men were able to adapt themselves to this sort of activity more easily than were the territory men, who had been and were still selling

LIVING-ROOM AND DINING-ROOM RELIGHTING RESULTS IN 29-DAY ACTIVITY—OHIO PUBLIC SERVICE COMPANY

Division	On Trial	Sales	Quota Dining-Living Room Fixtures	Per Cent of Quota	Kitchen Units	Total Lamp Wattage Sold
Mansfield	32	419	290	144	48	148,110
Sandusky	5	289	210	138	47	137,190
Elyria	8	436	205	213	47	111,065
Ashland	0	218	90	242	53	52,750
Massillon	20	528	255	207	97	116,800
Alliance	13	461	255	180	57	155,955
Lorain	11	477	265	180	105	167,135
Warren	14	507	350	149	125	192,905
Port Clinton	2	60	80	75	3	26,935
Totals	105	3,395	2,000	170	582	1,108,845

all lines of merchandise and working to maintain a high standard of customer relationship at the same time.

During the entire activity morning sales meetings were held at each property. This afforded an opportunity to discuss the previous day's experience and further to stimulate the salesmen. Once a week these meetings were attended by executives from the general offices of the company.

Each property submitted a detailed daily report to the general office. These were carefully analyzed and tabulated and sent out the same day to each property, showing by a comparative set of figures the results accomplished on each property for the previous day and for the activity as a whole from the first day. Through this a friendly rivalry sprang up between properties and between individual salesmen.

The analysis of these figures also served as a basis of immediate information to point out a falling off of sales on any property and to enable the general office to correct such a condition promptly either through correspondence or personal contact.

The Offer to the Customer

This relighting activity as announced to the public was a special 30-day offer of a living-room and dining-room fixture made to a new standard of design, workmanship and ability to do a good lighting job. Not only was either fixture offered at a special price of $24 payable in twelve monthly installments but an allowance of $4 was made for each old fixture replaced if it was turned in to the company.

For renters, the company agreed to take down the old fixture and wrap it for storage on the premises. If the renter moved within a period of one year, the company further agreed to move the new fixture and rehang the old one without further charge to the renter. Any customer who paid for the fixture in full within 30 days was entitled to a discount of 5 per cent from the net amount of the bill for prompt payment.

The approximate financial set-up behind this offer is as follows:

	Per Cent
Selling price	100.00
Cost complete	45.00
Sales commission	12.50
Advertising	4.17
Allowance	16.67
Miscellaneous	2.08
Hanging cost	5.21
Carrying time payments	3.12

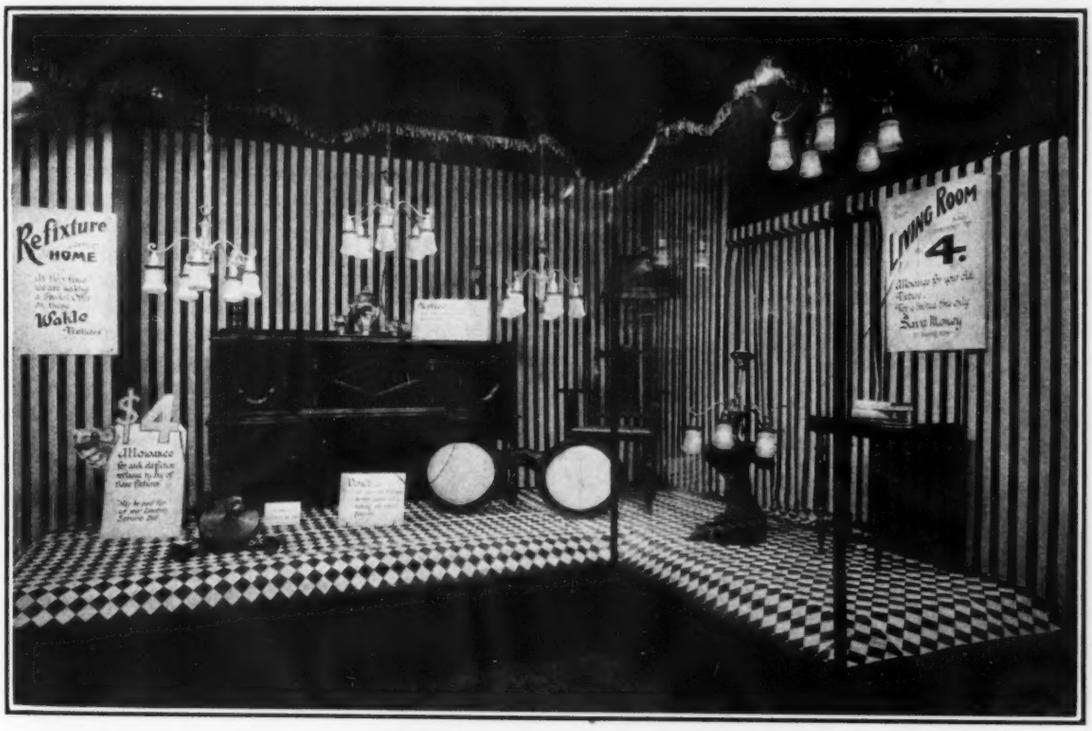
The original plan called for a refixturing campaign and the sale of merchandise. After the first few days' experience it was found advisable to make a radical change, for the use of the word "campaign" materially

increased sales resistance and it was difficult to sell fixtures as merchandise.

A new method of approach was inaugurated, and the salesmen were provided with information that would permit them to sell a lighting service to the home. The story of lighting and its relation to eyesight conservation was the backbone of the new approach, and the salesman talked it from the standpoint not only of its effect on the eyes of school children but also of its effect upon the eyes of every member of the family.

This educational service on the part of a utility produced greatly improved customer relations with the largest group of customers on the lines at the same time that it produced results commercially.

The work of the salesman was reinforced with display advertising in the newspapers and with show-window and showroom displays. Some salesmen carried physical samples with them and others worked from photographic reproductions. Both methods produced results.



WINDOW DISPLAY OF REFIXTURING OFFER

In selling additional lighting equipment to the home the probability of an increase in the amount of the monthly billing should be covered by the salesman in order that such an increase may not be unpleasantly and unexpectedly brought to the customer's attention at a later date. This is especially true since a little constructive selling of the fixture and of the service it will render will eliminate practically all possibility of trouble later.

There is the further consideration that the customer, once properly advised of the increase in wattage, will be more than ordinarily careful in its use at the start. However, as the period of use increases and the advantages of the better lighting are more appreciated, this watchfulness on the part of the customer will decrease. In other words, the ultimate increase in the bill will be postponed until the customer is thoroughly sold on the value of the service. Experience shows that the maximum lighting bill will probably be reached in a period not exceeding 90 days and usually less.

It has been found essential to have on hand a sufficient stock of units and to have made suitable arrangements with installation men so that the actual hanging of the fixture may be made within 36 or 48 hours of the time when the sale was closed. This applies whether the hanging of fixtures is done by men in the employ of the utility or in the employ of a contractor-dealer who has taken this work on a contract basis. Where this detail is neglected, a relatively high rate of cancellations will be encountered.

The activity of the Ohio Public Service Company has shown that the greatest market is among the middle-class homes. In more expensive residences, style and individuality are largely factors, and in the very poor homes the cost of such an improvement makes a sale doubtful.

RELATIONS WITH CONTRACTOR-DEALERS

In order that contractor-dealers might share in the results of this activity and actively co-operate and contribute to its ultimate success, the Ohio Public Service Company extended to them the privilege of displaying and selling the advertised fixtures at the advertised price.

To make this possible without any investment on the part of the dealers, sample fixtures were consigned for display purposes and additional fixtures were sold to them at cost (complete with glassware and delivered) to cover sales made. If a dealer made a sale on a twelve-month payment plan, the Ohio Public Service Company agreed to take over the credit and collection under its regular plan for a charge of $1 per fixture to the dealer. This was subject to the approval of the credit risk.

In this way the dealer was permitted to make exactly

the same offer to the customer as that made by the utility and to compete with the utility in the sale of these fixtures at a rate of profit equal to or greater than that of the utility, since the major selling expense was borne by the utility. This plan was very favorably received by the trade and one dealer stated that he sold more lighting equipment during the period of the activity than he sold in any other month since he had been in business.

RESULTS

Not all of the results of this activity may be measured in terms of fixtures sold. Each of the two feature fixtures was equipped with lamps totaling a minimum of 250 watts.

According to a study made at the time of the essay contest, the wattage figures per room in the homes served by the Ohio Public Service Company were found

SHOWER TYPE LIVING-ROOM FIXTURE FEATURED IN CAMPAIGN

to correspond very closely to the figures for the country as a whole. Without further calculation, it is assumed that these figures still hold and that in the dining room the 250 watts in the new fixture replaces an average of 125 watts used in the older equipment. In the living room an average of 141 watts for all equipment in the room has been replaced by 250 or 300 watts in a new ceiling fixture alone.

In other words, the wattage of these active sockets has been doubled in this activity. The number of burning hours per year will undoubtedly show an increase; certainly they will not decrease. Assume, however, that they remain constant and the rate of increase in load and revenue is obvious.

The results of this initial effort have convinced the Ohio Public Service Company that it will be justified in continuing this effort over a period of years. This will be done on a basis of a few men devoting their entire time to the refixturing of old homes. In addition each year a 30-day activity will be put on, at which time the remainder of the entire sales department will be devoted exclusively to extending the quantity and quality of home lighting.

Solution of Long-Distance Transmission Offered by Baum

A METHOD that is more efficacious in imparting stability to long transmission lines than anything so far known is embodied in Patent No. 1,617,007, granted to F. G. Baum, and assigned to the Westinghouse Electric & Manufacturing Company, according to W. S. Rugg, vice-president in charge of engineering. "By means of it," he says, "the capacity of a given line can be increased 75 per cent, at a cost not exceeding 20 per cent of the original cost of the line. Mr. Baum's invention eliminates one of the difficulties that have seriously embarrassed electrical engineers during the extensive superpower developments which have been taking place in the past few years."

"My invention," said Mr. Baum, "makes a transcontinental transmission system feasible theoretically. However, such a system will certainly never be built, because it would not be justified economically. The longest line transmitting power directly that will in all probability ever be built in the United States is one which may some day bring the water power of the Rockies to the Mississippi Valley. Such a line might be from 500 to 1,000 miles long and would be made entirely practicable from a technical standpoint by the use of this method. The invention covers the connection of a plurality of automatically regulated synchronous condensers at uniformly spaced points, connected directly to the high-voltage transmission line. The effect is to transform a long line into a series of relatively short lines, in each of which the factors that cause instability can be readily controlled.

"By dividing the transmission line into relatively short sections (about 100 miles in length) and supplying a corrective current under light-load conditions to the line from a synchronous condenser installed at each section point, a substantially constant potential can be maintained throughout the length of the line and power can be received or supplied at any of these points, requiring only a minimum of additional generating or distributing apparatus. In case the line is supplying a load at an intermediate point as well as at its terminal, the synchronous condensers would still be overexcited by the voltage formerly existing if the load at the intermediate point were suddenly thrown off. The voltage at this point would not undergo any substantial rise in value, since the synchronous condensers in the section would become underexcited upon the occurrence of a relatively small increase in potential and would thus inherently act as stabilizers to hold the voltage down.

"The stabilizing effect would occur irrespective of the total length of the transmission line, since the individual sections would inherently act in the manner set forth, regardless of the distance from any generating station."

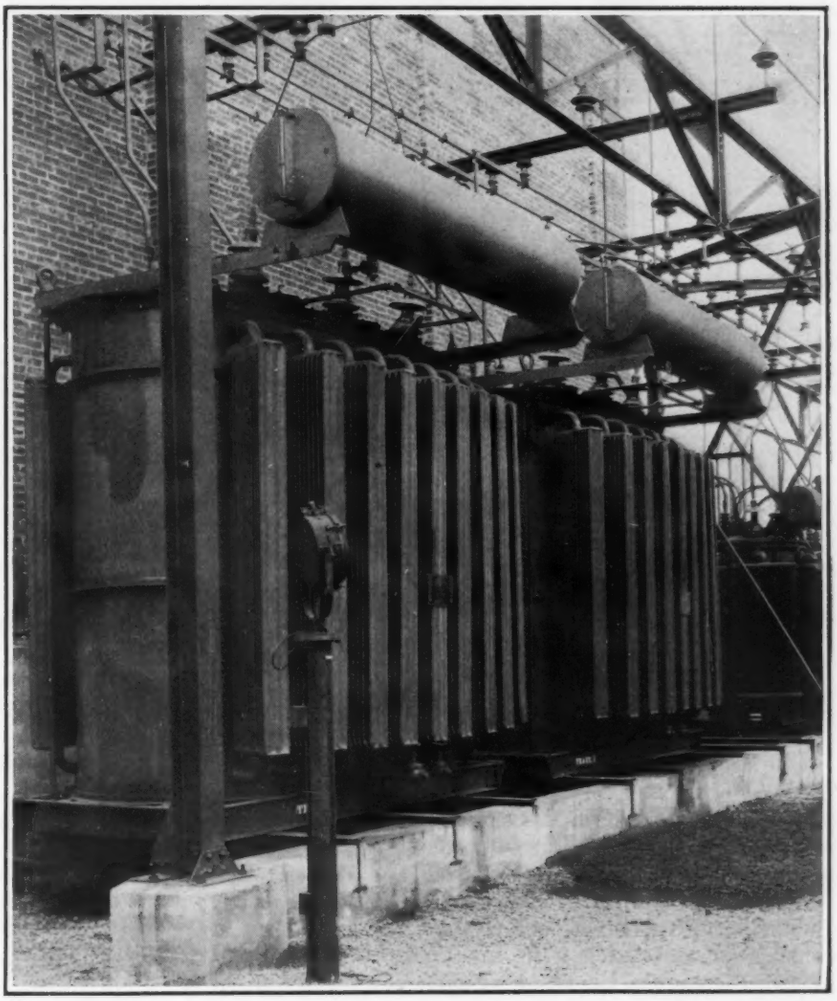
Outlining some of the objects of the method proposed in his patent, Mr. Baum says: "This method provides a high-voltage transmission system in which power may be taken from or supplied to a line at any point, in which the direction of power transmission over all sections of the line may be reversed, in which practically constant voltage may be maintained for all conditions of load, in which the question of the natural periodicity of the line is eliminated, with which simpler and cheaper generators may be used, with which transformers may be standardized for one voltage, with which insulation strains may be reduced, and with which the flow of power would have the greatest possible flexibility."

4,000-Kva., Three-Phase Transformers for Jersey Substations

Conditions That Led to the Adoption of Recent Policy—Operating and Economic Reasons for Selection of Three-Phase Units for Power—Some Features of the Transformer Specifications Now Employed

By F. W. GAY* and J. D. WINANS†
Public Service Production Company, Newark, N. J.

FOR so-called power, or substation, transformer installations the Public Service Electric & Gas Company has started what is a new practice for its system—namely, the use of 4,000-kva., 26,400-13,200/4,150-volt, three-phase, oil-immersed outdoor transformers. The first unit of this character has just been installed in one of its Newark substations serving a densely populated district and will operate at 13,200 volts, 60 cycles, on its high side. Based on present conditions, including an extremely high cost for labor in the metropolitan district around Newark and a substation design in which the installation of transformers is by no means the greater part, five and one-half per cent is the approximate saving in first cost per kilovolt-ampere of load expected to be realized by the use of three-phase units, whereby the recommended maximum load is increased twenty-five per cent per substation. Three distinct steps which have led up to this new policy are reviewed here for the benefit of persons who may have to consider other arrangements than they now have. At first 60-cycle substations were designed for 13,200-volt, three-phase, incoming feeders and for 2,400-volt, two-phase, outgoing feeders. For the most part the transformers were of the indoor T-connected duplex type, with interchangeable main and teaser units, and were cooled either by natural oil circulation or by forced air circulation. Low-tension taps were provided to carry the rated kilovolt-amperes at 2,400 volts with successive drops in the high-side terminal voltage.



TWO 4,000-KVA., THREE-PHASE TRANSFORMERS AT CLAY STREET SUBSTATION

The second step was made when load forecasts indicated that a remodeling of the distribution system and consequently the substation design was desirable. New substations remote from generating stations were constructed for 26,400-volt incoming lines and old substations similarly located were changed from 13,200 to 26,400 volts high tension. All new substations were designed for three-phase, four-wire, 4,150-volt distribution and old substations the load of which warranted were changed from two to three phases low tension.

The majority of new transformers installed during this period were of the outdoor, oil-immersed, self-cooled, single-phase type, air-blast transformers being used with existing equipment and duplex units being brought from other substations whenever it was advisable to increase two-phase facilities. A single-phase unit was obviously the type upon which to standardize

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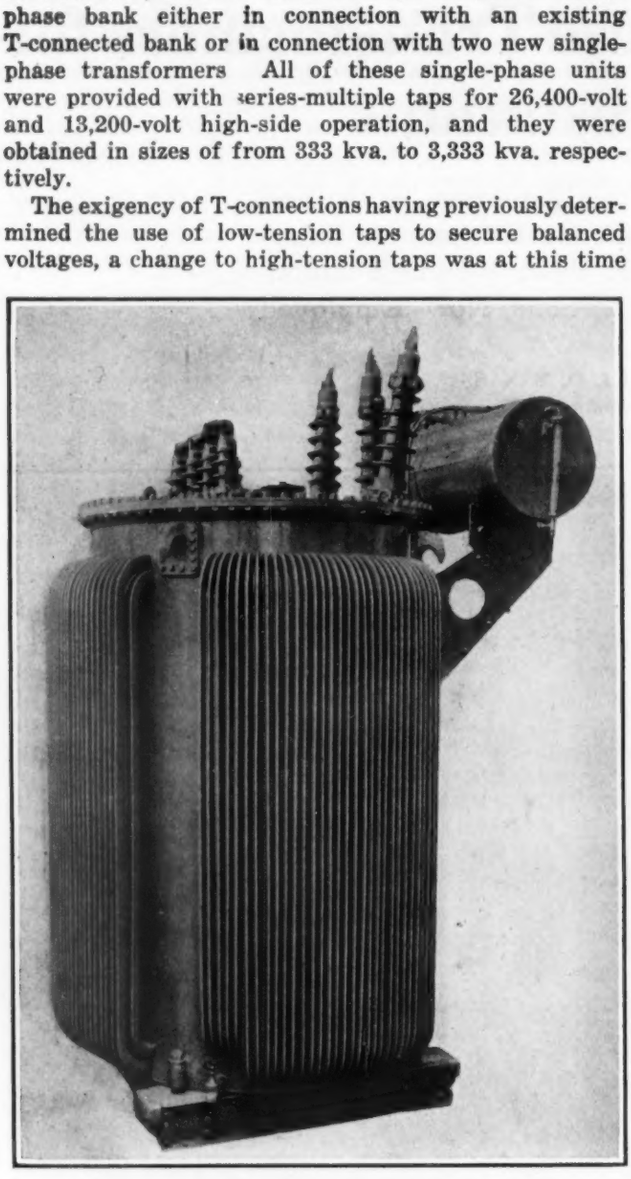
†Engineering assistant.

at this time, since it could be used to form a three-phase bank either in connection with an existing T-connected bank or in connection with two new single-phase transformers All of these single-phase units were provided with series-multiple taps for 26,400-volt and 13,200-volt high-side operation, and they were obtained in sizes of from 333 kva. to 3,333 kva. respectively.

The exigency of T-connections having previously determined the use of low-tension taps to secure balanced voltages, a change to high-tension taps was at this time



A TYPE OF 4,000-KVA., THREE-PHASE TRANSFORMER USED BY JERSEY UTILITY

put into effect in order to take advantage of the most effective design. Successful paralleling with the secondary-tapped existing single-phase and duplex units was made the subject of study by the engineers of the Public Service Production Company, the designer and constructor associated with the Public Service group of New Jersey, and the resulting table of approved high-tension and low-tension turns is a novelty in transformer specifications. This table was developed after conferences with the manufacturers' engineers and has ever since been incorporated in the power-transformer specifications not only as an assurance to the purchaser that transformers will satisfactorily parallel but also as an assistance to the manufacturers in selecting suitable designs.

Immediate Cause and Desirability of Change

Throughout the period during which the three-phase, four-wire distribution system was in the development stage it was realized that the time was approaching when consideration must be given to the question of using three-phase units. An analysis of the situation made in the winter of 1925-26 evolved the fact that single-phase units then in operation were more than sufficient in number to provide mates for all the duplex units on the system. Consequently the time had come when a change in policy could be made, and only the desirability of the change remained to be proved.

Previously 20,000 kva. had been set by the electric distribution department of the Public Service Electric & Gas Company as an arbitrary maximum load for any one substation of the type under discussion. Change-over layouts and new substations had been designed for this ultimate capacity, existing transformers being used if possible and the length of all transformer sections being kept within 100 ft. The latter limitation necessitated in each case a substation having two three-phase banks of the proper capacity and one single-phase spare unit located so as to be readily accessible for connection to either bank. As a result the ultimate substation contained seven 3,333-kva., single-phase units arranged in two 10,000-kva. banks with one spare transformer, thus giving 23,333 kva. in transformers, with 20,000 kva. regularly in service.

However, since considerable time would elapse in case of a single-phase failure before the faulty unit could be cut out and the spare unit cut in, it was considered advisable to load the substations to only about 80 per cent of the capacity of the two banks to secure the highest service continuity. Although this policy reduced the amount of load dropped, it greatly increased the substation cost per kilovolt-ampere of load, since a substation with 23,333 kva. in transformers carried only 16,000 kva. in load.

Substations Divisible Into Four Classes

Considering substations from the viewpoint of load increase, it was found that they were divisible into four classes: The first included those with a load growing at the rate of from 1,100 to 1,200 kva. per year; the second, from 600 to 800; the third, from 300 to 400; and the fourth, from 50 to 100. For substations of the first and second classes three-phase units of large capacity were considered, the single-phase and duplex units already on the system being estimated to be capable of caring *ad infinitum* for substations of the third and fourth classes. With the decision to predicate power-substation design upon the use of oil-immersed self-cooled power transformers in the 4,000-kva., three-phase size, the third step in the development may be said to have been taken.

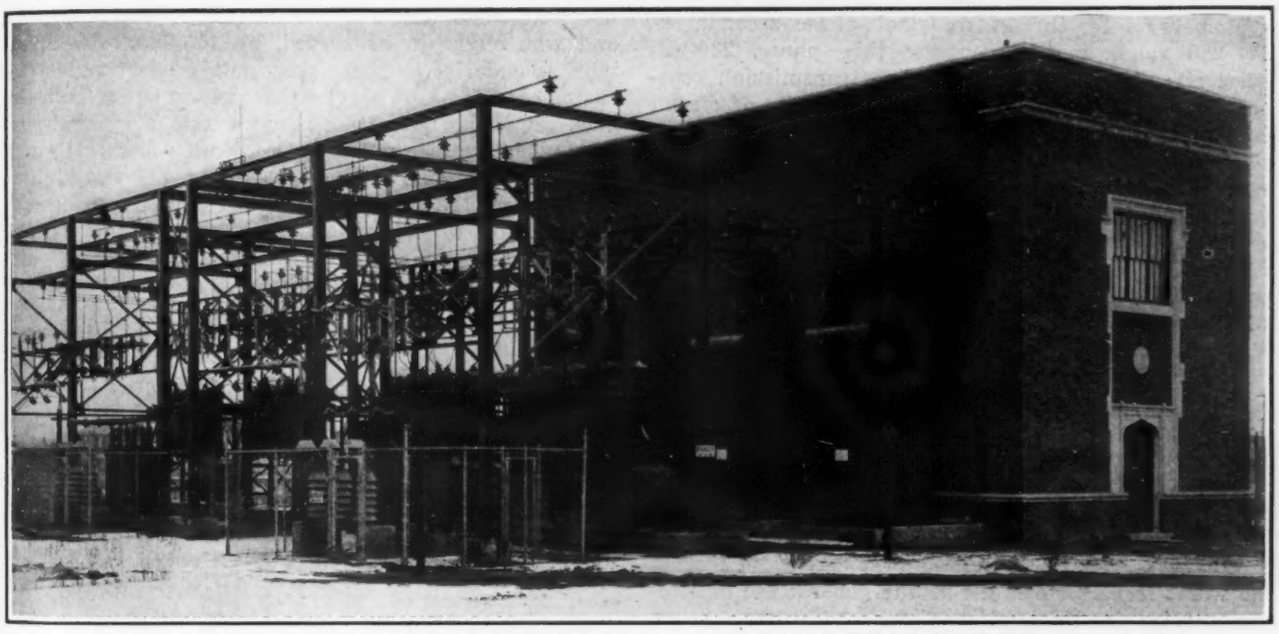
Many advantages are expected to accrue from this

COMPARISON OF THREE-PHASE AND SINGLE-PHASE TRANSFORMERS FOR 20,000-KVA. SUBSTATIONS

Item	With Three-phase Units	With Single-phase Units
Number of units	6	7
Outdoor space requirements, ft.	12 by 84	12 by 84
Kva. per unit	4,000	3,333
Number of banks	3	2
Kva. per bank	8,000	10,000
Total transformer capacity, kva.	24,000	23,333
Transformer capacity in service, kva.	24,000	20,000
Transformer capacity in service, one bank out of service, kva.	16,000	10,000
Load which can be carried during change, kva.	20,000	12,500
Recommended maximum load	20,000	16,000
Part of recommended maximum load which must be dropped during change, kva.	None	3,500

step. It was known from the start that several large operating companies are using three-phase units in their substations of this type as a means both of reducing the space required and of affording the protection of a spare transformer always ready for service. Among other desirable features that will be forthcoming are increased load capacity for each substation, lower substation cost per kilovolt-ampere of load carried, lower manufacturing cost per kilovolt-ampere installed, improved delivery on transformer orders and decreased shifting of units from substation to substation. A comparison of the principal features of a 20,000-kva. substation with three-phase and with single-phase units is given in the table which appears on the preceding page.

Orders were placed early in the spring with several transformer builders in order that the manufacturers and the purchaser might have the greatest opportunity to study the design of a unit the type and size of which would fully meet the requirements of the system.



SOUTH PATERSON SUBSTATION WITH BANK OF 4,000-KVA., THREE-PHASE TRANSFORMERS

FEATURES OF SPECIFICATIONS

All the new transformers are arranged to receive the necessary ventilation when installed on 14-ft. centers. Those that employ radiators rather than tubes to facilitate the oil circulation are designed for a minimum of projected floor area, the specification in this case calling for either welded connections or approved valves at each juncture of radiator and tank. Radiator drain plugs are required for ease in transporting all units equipped with removable radiators.

Five per cent is the nominal rated impedance of the transformers, this year's builders having been limited to a variation of plus or minus 0.4 per cent. It is expected that the manufacturers, having now worked up their design, will be able to meet limits of 4.8 per cent and 5.2 per cent in the future. The thermal capacity (defined as the length of time during which each unit must be capable of withstanding without injury a secondary dead short circuit with rated primary terminal voltage maintained) has a specified minimum value of three seconds instead of the conventional two.

Conservative figures for the capitalization of losses, load and no-load, respectively, have been part of the Public Service purchasing plan for a number of years. A new departure—limiting the exciting current at rated high-side voltage to 2 per cent of the high-tension full-load current—has been embodied in the specifications covering future substation transformers.

Two precautions have been taken to prevent the reservoir oil gage from indicating a false level. The first of these is the prohibition of a shut-off valve in the connection between the reservoir and the transformer tank. The second is the requirement for connecting the bottom of the gage to the reservoir on a level with the top of the pipe leading from the reservoir to the transformer tank.

Consideration is now being given to the possibility of obtaining added output from these transformers by the use of air jets playing on the radiators or tubes—an auxiliary means of increasing capacity to which the attention of the operating companies has been directed during the last few months. Tests conducted on several of the completed units suggest that the specification for power transformers might well be enlarged to include overload requirements under this condition, with ambient temperatures both equal to and lower than 40 deg. C.

Inasmuch as the yearly peak load for nearly every substation on the system is reached in the neighborhood of sunset on a November or December evening, the benefits derivable from the application of this principle are manifest, the ambient temperature then being less than 10 deg. C. Moreover, it is believed that investigation will show its extensibility to major transformer installations in generating and switching stations as well as to other designs of distribution substations. In any case, if present indications on the Public Service system can be taken as criteria, it is not unlikely that the 20,000-kva. substation, which yesterday carried a maximum load of 16,000 and today carries 20,000, will tomorrow carry 24,000.

Letters from Our Readers

General-Purpose Secondary Circuits

To the Editor of the ELECTRICAL WORLD:

I think there is a drift toward ill-considered adoption of four-wire, three-phase secondary circuits, with Y voltage and delta voltage, 115-208 volts. If I did not recognize the academic character of most of the Institute discussions, I would say that the acceptance of that style of secondary is imminent, but I observe a lack of discussion of the subject by the people who have to make the decision and a lack of discussion of it by men who would have to sell an inferior service to customers who are now well served.

It is true that the present good service to those customers is by three-wire, single-phase secondaries, 115-230 volts, and by separate three-phase, 230-volt delta circuits for power, and that transmission economies could be had and greater convenience of circuit construction and maintenance obtained if these two services could be combined in one three-wire or four-wire secondary. But if, as my creed requires me to believe, our business is to serve our customers well, at a price which the customers are willing to pay for good service, we have no sanction for seeking operating economies at the cost of inferior service to customers who are at present satisfied. I admit obstinacy in insistence upon good service to satisfied customers. But if our industry has any other object of existence, I would like to know what that object is. Our business is certainly not to deliver a specified amount of energy at customers' terminals, with a maximum efficiency of production and distribution. That thing is only a desirable incident of our main purpose.

I have believed for some 25 years—since I made my first personal study of British practice in 1902—that the worst *technical* obstacle to the general use of electric service in England was the unfortunate selection of 230 volts (or thereabouts) as standard voltage for lighting. The British consulting engineers set up their problem as the delivery of electrical energy at customers' terminals at the least cost. Now, what shall it profit a customer if you deliver energy cheaply at his terminals and the "juice" is too hot for his employees and his womenfolk to handle? You will recognize my meaning if you will read the British discussions of necessary earth wires and shield wires and other precautions for the safety of users of domestic appliances, and if you will remember that 230 volts to earth is entirely too lively a pressure to be given to women and children to work with or play with in the fashion in which we let our women and children deal with our supply at half that voltage.

The delivery of 230-volt supply with its concomitant of lamps which for equal cost are basically less efficient than 115-volt lamps, and domestic appliances which may need to be handled with gloves, is not a parallel to the proposal to standardize the 115-208-volt secondary on our side of the water. But it had its roots in the same lack of commercial sense that characterizes much of the argument in favor of the technically beautiful four-wire, three-phase arrangement. It is nothing to the young lives of our distribution engineers if the customers have to accept reduced power or increased heating of all the existing 230-volt motors. Neither is it anything in those young lives if the 115-230-volt interior wiring, such as now serves domestic ranges, has to be doubled up at the customer's expense or else metered by polyphase meters at the company's expense. The problem in external distribution being duly solved, the problem of interior costs and frictions is to be remitted to the executives and the sales departments, with the blessings of the 100 per cent engineers.

Thus far I have written as a manager. As an engineer I am amused to see an essayist strain at the gnat of the lower efficiency of the two-phase motor and in the next paragraph swallow the camel of the inefficiency of a 208-volt secondary as compared with a 230-volt secondary. The evasion of metering problems is also a jest to me—an engineer formerly expert on meter problems and not now ignorant. And the cream of the whole joke is the disregard in this engineering discussion of the fact that there are potentially four times as many domestic customers who are served, or can be served, and who ought to be served, by 115-230 volt, three-wire secondaries as there are commercial or industrial customers for whose service three-phase power is desirable. It should go without saying that a general-purpose polyphase secondary circuit which cannot branch out into single-phase, three-wire circuits of the highest useful voltage is not what is needed for our business.

The whole discussion could be brought back to the one question, Are we out to demonstrate efficient distribution or are we out to give good service to satisfied customers? After that is answered it might be worth while to inquire who is to gain by any distribution cost saving. If we keep it ourselves, it will be the first time in the industry that we have kept to ourselves any saving in the cost of service. If the customers make the saving by accepting the troubles and costs of the change to 115-208 volts, they will not thank us at all—they may do just the reverse.

I am suggesting to our own engineers that they put in some more thought and some more study and experiment on the development of secondaries which will meet the common-sense requirements of the case. Such secondaries are possible.

ALEX DOW,
President.
Detroit Edison Company,
Detroit, Mich.

Large Amount Invested in British Electrical Industry

THE total amount of capital invested in all branches of the British electrical industry is approximately £768,000,000 (about $3,724,800,000), according to advices from the Consulate General at London, made public by the Department of Commerce. The increase in such capital during the fiscal year 1925-26 amounted to about £48,000,000, and the average rate paid on capital during that period was 5.78 per cent. Of the total capital invested in the British electrical industry, electricity supply undertakings account for £251,500,000, electric traction for £271,300,000, telegraphs and telephones for £112,900,000, and manufacturing, etc., for £131,700,000.

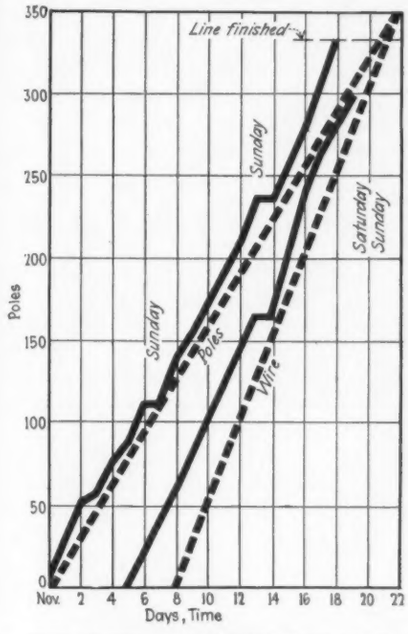
During the year mentioned 5,953,329,000 Board of Trade units of electricity (kilowatt-hours) were sold to 1,756,000 customers, and the lamps and other apparatus connected to the public mains represented the equivalent of 242,135,732 30-watt lamps. The total number of electrical undertakings of all kinds recorded in a leading British electrical manual is 3,430 in Great Britain and all parts of the British Empire.

Central Station and Industrial Practice

Holes Dug and Poles Set from Flat Car

Mechanical Aids Employed to Expedite Transmission Line Construction in Face of Almost Insurmountable Obstacles

IN RECONSTRUCTING the light and power lines serving three small towns near its new Avon station the Cleveland Electric Illuminating Company's line department recently made an interesting and unusual use of hole-digging and pole-setting machines. The work to be done presented several problems, among which was rebuilding a short transmission line along the right-of-way of the Lake Shore Electric Railway. The new line was to be 33,000 volts and it was necessary to keep the former 18,000-volt line in service part of the time in order to supply energy to the interurban substations during peak hours.



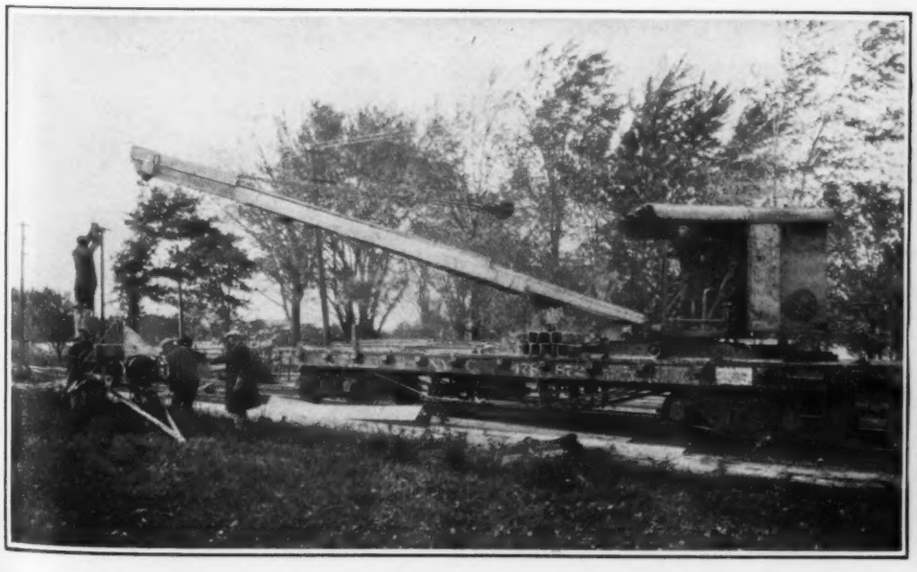
TIME SCHEDULE FOR COMPLETION OF LINE CONSTRUCTION

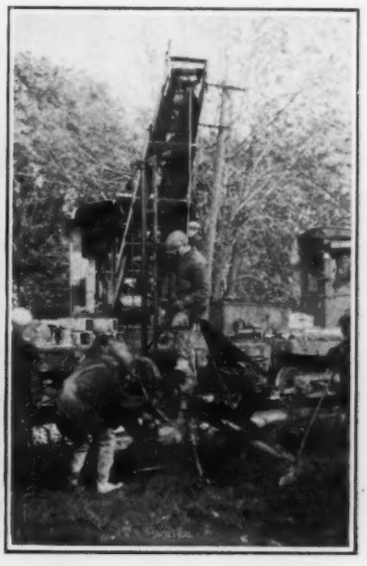
Dotted lines indicate schedule, solid lines actual time required.

The program as laid out by C. N. Rakestraw, superintendent of distribution, called for the setting of poles ranging in height from 45 to 65 ft. and stringing wire on them. From the standpoint of weather the work could hardly have come at a more unfavorable time, as rain and wind were almost incessant and the ground along the right-of-way was a quagmire. It was also essential that the work be completed with all possible speed.

For a number of years the company's line department has used hole-digging and pole-setting machines operated on motor trucks, because of their labor and time-saving advantages. It was found, however, that the trucks could be used on less than half the work, as there were no roads and the condition of the ground would not support even a caterpillar tractor. The demand for speed in completion of the work precluded the use of manual labor, and the solution was found in a

CRANE SETTING POLE IMMEDIATELY AFTER HOLE WAS DUG WITH BORER





AT LEFT—CRANE MOUNTED ON FLAT CAR SETTING BORER IN POSITION. AT RIGHT—BORER DRILLING FOR POLE

new adaptation of line-building equipment.

A railroad flat car was rented and on one end of this a Universal crane with a 28-ft. boom was mounted over the trucks. This crane was used to distribute the poles along the interurban right-of-way and later for placing them in the holes when dug.

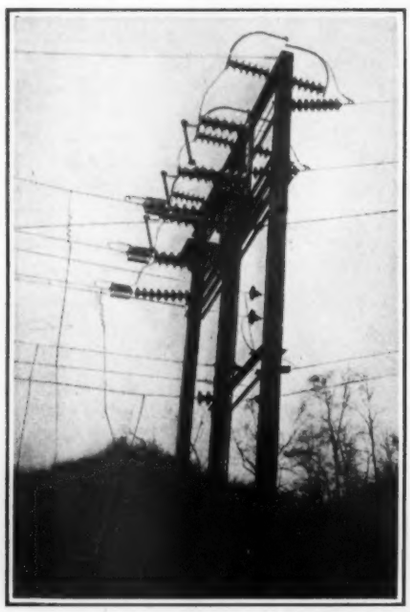
For the hole-digging operation a Buda portable earth drill was obtained. An electric work car was rented from the interurban company to move the hole-digging and pole-handling equipment along the right-of-way. The operation from this point was comparatively simple:

Coming to a site for a pole, the electric crane lifted the gasoline engine-driven borer off the car and set it over the spot where the hole was to be drilled, and when this was completed the crane was used to lift and set the poles in the holes.

In less than half the time the work could have been done by hand 185 poles were set in this way. The entire line called for 342 poles, the remainder being set by the regular truck-mounted apparatus. The linemen followed up the pole-setting crews, stringing, sagging and tying three-quarters of a mile of wire a day. The time schedule set for completing this job is shown in the accompanying diagram and it will be noted that the pole setting was done two days ahead of schedule and the entire job finished on schedule.

Commenting on the operation, Mr. Rakestraw said that only by the use of this equipment was it possible to get the work done under the conditions and that a very considerable saving was made over what the cost would have been with manual labor.

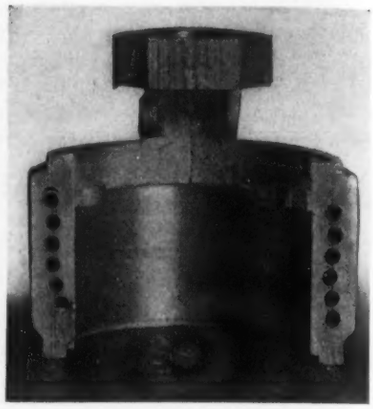
Mine-Substation Supply



A HIGH-TENSION structure that serves a 4,500-kw. bank of transformers feeding the Faraday coal development of the Pocahontas Fuel Company in West Virginia is illustrated here. The 110-kv. incoming lines of the Appalachian Power Company are equipped with disconnect switches, S. & C. fuses and lightning arresters. The fuses are directly in the line to the transformers and have been found very effective for protection. This development uses automatic rotary-converter substations for the mine supply, and operating records are very satisfactory. The production of coal is about 3,000 tons per day.

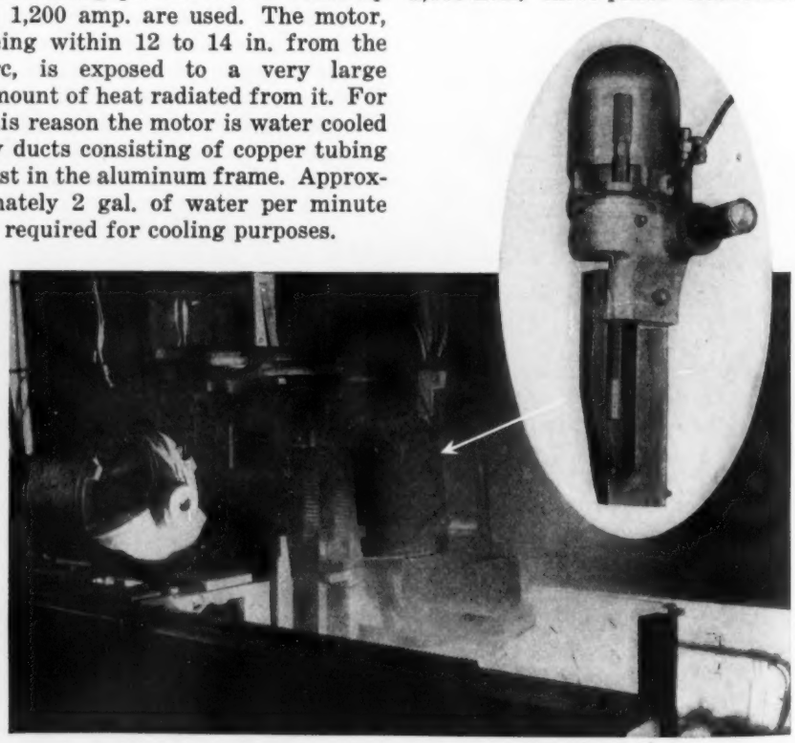
Motor Operates 12 In. from 1,200-Amp. Arc

AN INTERESTING application of a small electric motor to a job where the operating conditions are exceptionally severe is shown in the accompanying illustrations. The motor, which is built in the head of a Lincoln automatic carbon-arc welding machine, revolves the carbon electrode at a uniform rate of speed to insure the proper consumption of the electrode, thus tending to keep the arc stable. The motor also feeds the carbon electrode down to compensate for consumption due to oxidation. In the welding process arc currents up to 1,200 amp. are used. The motor, being within 12 to 14 in. from the arc, is exposed to a very large amount of heat radiated from it. For this reason the motor is water cooled by ducts consisting of copper tubing cast in the aluminum frame. Approximately 2 gal. of water per minute is required for cooling purposes.



ALUMINUM FRAME OF THE WATER-COOLED MOTOR WITH COPPER DUCTS TO CARRY HEAT AWAY FROM THE FRAME

The simplicity of the cooling arrangement and its general effectiveness indicate the possibility of application to larger motors for industrial uses where excessively high temperatures are encountered.



WATER-COOLED ELECTRIC MOTOR-DRIVEN HEAD ON AUTOMATIC WELDER WITH 1,200-AMP. WELDING ARC IN OPERATION. INSERT SHOWS DETAILS OF MECHANISM

Entrapped Transformer Gases Found Explosive

BY FREDERICK KRUG
Assistant to President Porto Rico Railway, Light & Power Company

AN UNUSUAL accident occurred recently in a hydro-electric plant, resulting in severe burns to two men. A short circuit had developed in one of the windings of a 2,000-kva., three-phase transformer

and the unit was cut out of service. Two mechanics climbed to the top of the unit with a lighted gasoline torch to unsolder the connections so that the transformer could be rolled out of its compartment and the coils and core removed from the case.

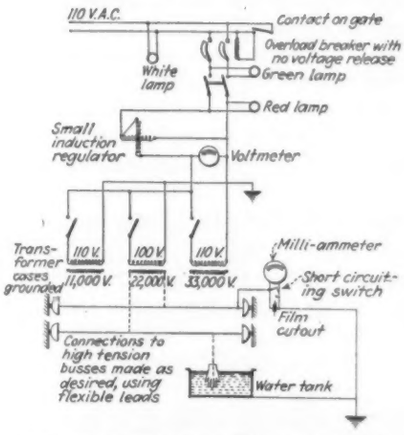
The men had not removed the manhole cover, but one of them apparently loosened a plug near the low-tension terminals when there was a flash and an explosion that blew one of the men to the floor 12 ft. below, inflicting severe burns and bruises. The other man escaped with burns about the head and arms.

This accident apparently indicates the necessity of opening the manhole covers on large transformers to release the gases that may have collected in the case following a short circuit within.

Glove Tester and Drier that Save Time

BY A. D. MACENTYRE
Assistant Engineer, Bureau of Tests and Inspections,
Pacific Gas & Electric Company, San Francisco, Cal.

DURING the winter of 1925-26 the volume of linemen's rubber gloves and protective devices tested by the Pacific Gas & Electric Company became so great that existing methods and equipment proved inadequate. New apparatus and a new routine of handling material were then devised that have cut down the time required for inspection and testing to half of what it was before.



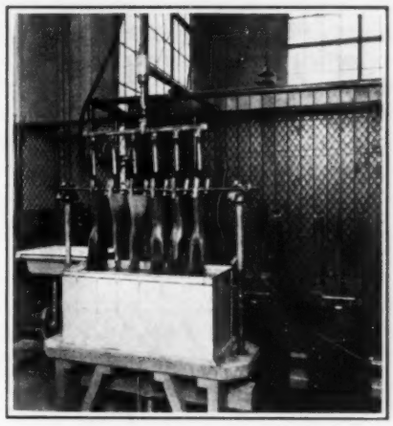
WIRING DIAGRAM OF HIGH-POTENTIAL TEST SET

The glove-testing tank and the method of drying the gloves are of particular interest. The testing tank illustrated takes six gloves, which are clipped to the rack over the testing tank. This rack is made of two parallel brass rods swung between two porcelain insulators. Each insulator is mounted at the top of a vertical rod, which slides up and down in a tube. The whole is counterbalanced by weights so that when the gloves are empty they hang above the tank, but when filled with water, the rods slide down until the gloves are immersed to the proper depth in the tank. All gloves are filled with water simultaneously by six jets from a header above. The header moves in a vertical guide and is counterbalanced.

When the gloves are filled, a rod with six chains soldered to it is placed across the insulators. Each end of the rod is in contact with one side of the high-voltage test circuit and each chain makes contact with the water in a glove. The high-potential circuit is completed through the grounded tank. The entire process is rapid, clean and requires a minimum of work by the operator. The apparatus is portable and the filler swings up out of the way when not in use.

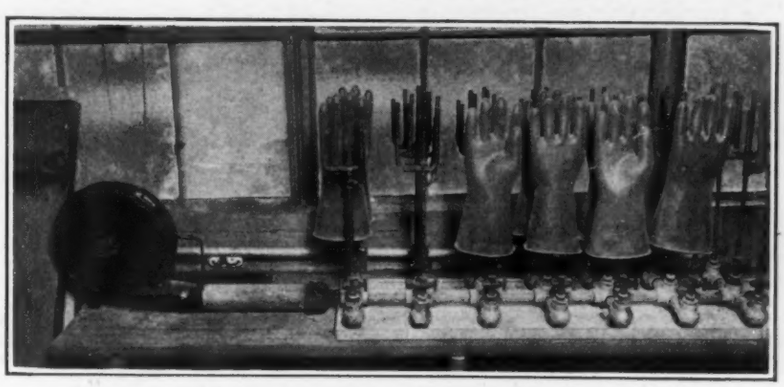
Punctured gloves are hung by clips to dry. Wet gloves that have passed test are placed on the drying rack shown in one of the accompanying illustrations. This rack consists of 36 vertical brackets, each made of $\frac{1}{8}$-in. brass tubing in the form of a hand. Warm air issues from the tip of each tube of the brass hands, and when gloves are dropped over these brackets, they dry quickly inside and out. A small blower driven by a $\frac{1}{10}$-hp. motor forces the air through a chamber containing a heater.

The whole inspection and testing procedure has been made simple and convenient and all apparatus is as nearly foolproof as possible. New rubber goods are given an acceptance test, whereas protective material in use is tested periodically. Used rubber gloves are washed and sterilized in an electric washing machine before being tested. Gloves and other rubber goods go first to a sorting table, where they are carefully examined for defects. The table has hoppers labeled "rejected" and "good." Gloves not mechanically defective are passed through the testing and drying process described above.



RUBBER GLOVE TESTING TANK THAT SPEEDS UP TESTING

Rubber gloves constitute about 75 per cent of the material tested, but line hose, shields, blankets and other rubber goods also are tested. In addition dielectric tests are made on oil, insulators, insulating materials, instrument transformers, etc. All tests comply with A.S.T.M. or A.I.E.E. specifications. The high-potential test set consists of three potential transformers, one 110/11,000 volts, one 110/22,000 volts and one 110/33,000 volts, arranged for multiple connection on the 110-volt or primary side and series conection on the secondary side. A small induction regulator in the primary circuit gives perfect voltage control from zero to 66,000 volts. Details of the high-potential set are given in the accompanying wiring diagram.

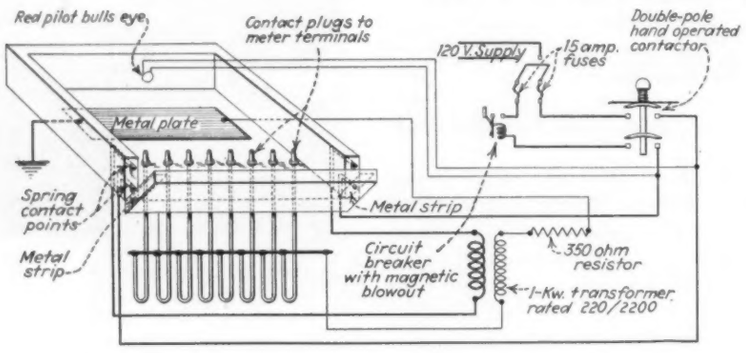


ELECTRIC DRIER AND BLOWER FOR DRYING RUBBER GLOVES

Meter-Insulation Breakdown Test

BY C. J. FUHRMANN
Superintendent of Electric Meters
Consumers Power Company, Jackson, Mich.

TO CHECK the insulation of all meters passing through the electric meter laboratory of the Consumers Power Company before they are reinstalled in service, the device illustrated here is used. New meters are also subjected to an insulation test. Although faulty insulation is found very rarely in new meters, a meter with defective coil insulation or faulty terminal insulation is found often enough to justify the test. This test reveals whether or not there exists any electrical connection between the coils or coil terminals and the base of the meter.



SCHEMATIC DRAWING OF METER-INSULATION TEST DEVICE

The device is built on a workbench with a wood barrier surrounding the live terminals and the grounded plate. The barrier on the most accessible side of the table is hinged and is normally open so that meters can readily be placed on the plate and connections completed. To the right of this barrier is located a hand-operated plunger double-pole, single-throw switch, which is normally in the open position. Directly back of this switch is a small 10-amp. circuit breaker, set very lightly, and equipped with magnetic blow-out.

The transformer and resistor are located on the floor under the bench. The 350-ohm carbon resistor is connected in series with the high-voltage circuit to limit the short-circuit current when a breakdown occurs. A red bull's-eye pilot lamp on the back barrier of the device indicates when the transformer is energized. The arrangement of parts and the electrical connections are apparent from the illustration.

In order to operate the device a meter is placed on the metal plate, back down, and the contact plugs are inserted in all the meter terminals. The hinged front barrier, which normally falls open, is held closed by the operator's left hand, bringing the two metal strips on the inside face into contact with the spring contacts that project about half an inch from the ends of the adjacent barriers. With his right hand the operator then depresses the knob of the spring contactor, thus completing the primary circuit. By this action 1,200 volts is impressed between the coils and coil terminals and the frame of the meter. This potential is maintained for a maximum time interval of 30 seconds. If a breakdown of the insulation occurs within this time, the small circuit breaker opens, clearing the circuit.

The reason for inserting the plugs into all of the meter terminals, when it appears at first thought that it is necessary only to make connections on one side of each meter coil, is to protect the potential coil from damage. Suppose that a meter was grounded through a defective terminal bushing. If the connection had been made only on the opposite terminal, the potential coil would be subjected to a voltage enormously higher than its rated voltage. As a result the current would be in excess of the current-carrying capacity of the copper in the coil, would destroy the coil and necessitate its removal from the meter.

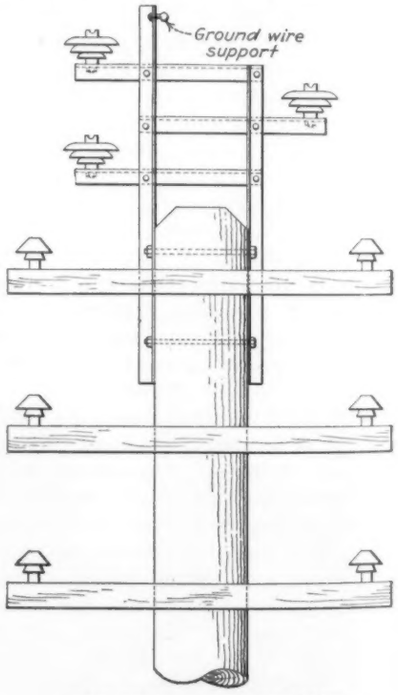
This device was designed and built primarily to protect the operator. It will be noted that both hands of the operator are occupied in energizing the transformer. This makes it an impossibility for the operator to come in contact with the 1,200-volt terminals while they are energized. If he should release either the plunger switch or the barrier, the primary circuit is immediately and automatically opened. It is also impossible to have some one other than the operator energize the device while the operator is connecting a meter for a breakdown test by closing the plunger switch, because the barrier is necessarily down.

Pole-Top Extension

BY E. J. MORRISSEY
Chief Electrician Western United Gas & Electric Company, Aurora, Ill.

ON THE top of each pole carrying the outgoing lines from the power house at Aurora is an angle iron extension frame. The wires tied on its insulators are now dead, but the extension performed a useful service for many years. Faced with the immediate need for bringing a high-voltage line from the plant and with every pin position on the one pole line already filled, the engineers of that past day worked out this extension frame, the idea of which still finds application.

The drawing is self-explanatory as to design and arrangement of parts. Three-inch angle iron was used. The structure was held together with



POLE-TOP EXTENSION FRAME

⅝-in. bolts, and the bolts through the pole top were of the same size. A feature is the simplicity of the ground wire support, a hook bolt in which the wire was laid and the hook bent closed.

Commercial Activities and Public Relations

Georgia Sells 5,679 Irons in Ten Days

IN A RECENT electric-iron campaign conducted by the Georgia Railway & Power Company 5,679 irons were sold in ten days. Using the national figure of 72 kw.-hr. per year as the consumption of these irons, this campaign added 409,000 kw.-hr. per year, or a revenue, based on 8 cents per kilowatt-hour, of $32,700. Of course, this does not mean that this is all additional, as many of the irons were sold to customers who already own one.

DIVISION OF ELECTRIC-IRON CAMPAIGN SALES IN GEORGIA

Office	Standing	Quota	Total Sold	Per Cent Quota Sold
Rome	1	275	534	194
Carrollton	2	75	115	153
Hartwell	3	50	75	150
McDonough	4	60	85	141
Dublin	5	125	155	124
Adairsville	6	50	62	124
Gainesville	7	125	150	120
Macon	8	500	600	120
Douglasville	9	60	70	116
Greensboro	10	25	29	116
Brunswick	11	200	217	108
Athens	12	125	134	107
Cornelia	13	75	79	105
Atlanta	14	3,000	3,016	100
Milledgeville	15	150	150	100
Conyers	16	50	50	100
Eastman	17	100	90	90
Vidalia	18	90	78	86
Totals	..	5,000	5,679	113.6

The Dover Six electric iron was featured and was sold to customers for $4.95, this price including a handy kitchen ladder stool that was given in each sale. The stools were purchased in carload lots at a very reasonable figure. After all expenses were deducted, including salesmen's commissions of 75 cents per sale and overhead, it was found that a profit of about 40 cents per iron was realized, this representing 8 per cent on the investment.

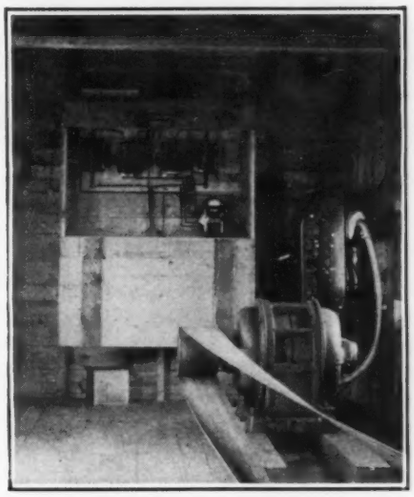
The distribution of sales over the territory served by the company is shown in the accompanying table. It will be noted that Rome led the list in percentage of quota, with sales of 534 irons and a quota of 275. This is particularly interesting, inasmuch as about a year ago the Rome Railway & Light Company, before it was purchased by the Georgia Railway & Power Company, sold 150 irons in ten days, having at that time 2,850 lighting customers. Atlanta, with slightly more than 30,000 lighting customers, accounted for 3,016 irons out of the 5,679 total.

About a month prior to the campaign each town was asked to send in a quota thought reasonable with local conditions. This quota was then doubled by the main office and a report of all quotas sent out. When this was received by the local men, a spirit of competition was aroused, ending in many of the towns again increasing their quotas. The final quota for all towns was 5,000. This figure was passed on the seventh day of the campaign, and as only 5,000 irons were available, active sales work practically ceased on an order from headquarters, though if anybody desired an iron the order was taken. Had the irons been available, it is thought that about 7,000 would have been sold in the ten days.

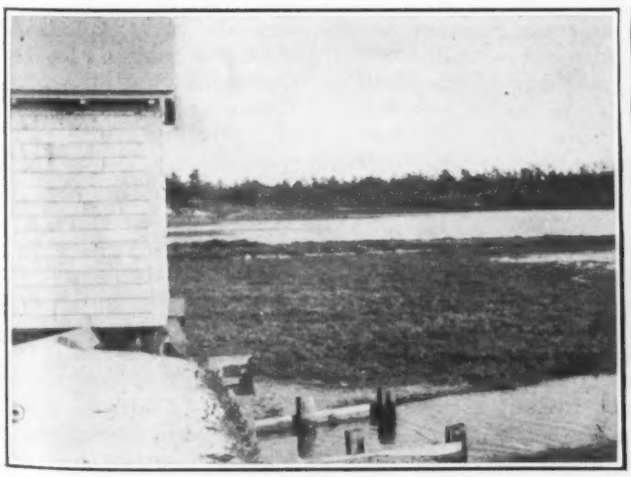
Electric Power in Cranberry Bog Pumping

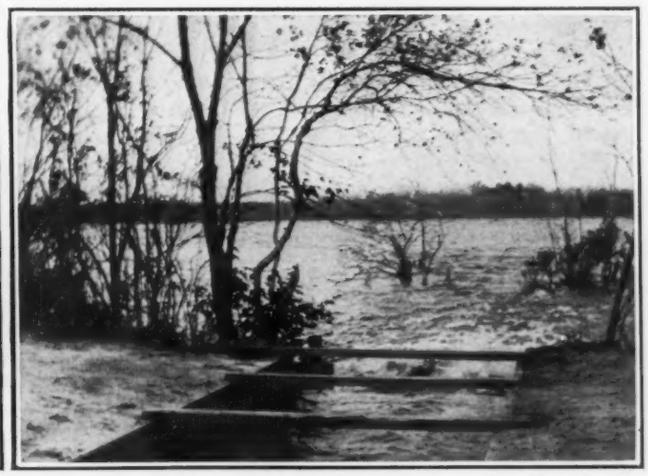
BY J. E. HUDSON
Engineer Southeastern Massachusetts Power & Electric Company, Marion, Mass.

BARNSTABLE and Plymouth counties, in the Cape Cod district of Massachusetts, produced in 1925 about 428,000 bbl. of cranberries, valued at $3,424,000. Flooding the bogs in which the berries grow is essential at certain periods to the preservation of the crop, and protection against freezing is of great importance. In the spring, when the berries are beginning to bud, any



STANDARD PUMP HOUSE INTERIOR, SHOWING PRIMARY METERING OUTFIT PROTECTED BY DROP DOOR, AND PUMP MOTOR WITH STARTING SWITCH





PUMP HOUSE FOR ELEVATING WATER 8 FT. IN CLEARING BOG TAILRACE AT 8-FT. ELEVATION, WITH DISCHARGE FROM 30-HP. PUMP

Another Utility Recognizes Effect of Modern Quarters

MODERN, pleasantly arranged business quarters always react favorably on the public. This illustration of the new location of the Salina office of the United Power & Light Corporation of Kansas indicates that the organization is cognizant of this fact and has prepared to capitalize on it.

severe frost would ruin the prospective crop, and in the event of threatened cold it is necessary to cover the vines with water. In the fall flooding serves the additional purpose of causing all berries too small to be gathered by scoops and any loose vines to float to the top, where windage usually bunches them near a lee shore. Flooding also kills certain insects and aids in preserving the bogs during the winter. Electric power is rapidly entering this field, and the Southeastern Massachusetts company had twenty bogs motorized at the close of last year, with a connected load totaling 860 hp. The revenue from this business in 1926 was about $8,000.

Gasoline-driven pumps formerly handled the water for the bogs in this district, but owing to their infrequent use in spring and fall proved unreliable and they were especially slow in starting at critical periods of weather. A pioneer 5-hp. electrical installation was made in 1919 at South Carver, but the first concerted effort to replace the engines with electric motors was in 1924, when a 30-hp. installation was made. Other bog owners followed suit so rapidly that in the South Carver district a 450-kva. transformer installation had to be constructed in time for the winter flooding, and there is now a connected load of 610 hp. at this substation. The prospects for at least 375 hp. additional business of this class at East Carver are good this year.

The majority of the motors are used to drive pumps for flooding—that is, raising the water from the natural ponds or reservoirs to elevations of 6 to 10 ft., whence the bogs are flooded by gravity. The adjoining bogs are usually flooded by opening the gates in dikes that separate them. In other cases the location of bogs with respect to the water is such that flooding is done by gravity alone, and in order to reclaim the water, motors are used to pump it back into these reservoirs. The duration of pumping generally varies between six and twelve hours, depending upon the acreage. In the fall flooding the demand usually occurs at the off-peak, but in the spring it is likely to occur on the peak, around 8 or 9 p.m.

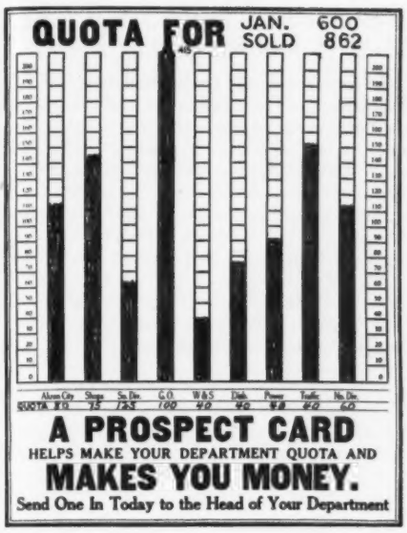
In most cases the propeller type of vertically suspended pumps has been adapted to motor driving. In a typical 30-hp. installation a 2,300-volt motor operating at 870 r.p.m. and having an 11-in. diameter driving pulley drives a pump pulley 30 in. in diameter at 319 r.p.m. A typical 60-hp. installation has a motor pulley 8 in. in diameter running 1,200 r.p.m., the pump pulley being 30 in. in diameter and running at 320 revolutions. Data on these pumps are scarce, many having been in service for years under gasoline motor drive. In 1926 the total energy consumption of a representative 60-hp. installation was 19,430 kw.-hr., yielding the central station a revenue of $595.84, and a 30-hp. installation consumed 2,360 kw.-hr. at $186.38. A demand charge of $6 per horsepower per year is in effect. The power company furnishes the complete pole line equipment, including a pole-type hand-operated oil switch, cutouts and primary metering outfit. The customer furnishes the rotating apparatus and the necessary equipment, and is billed for the construction costs. To the company the cost of a 60-hp., three-phase, 2,300-volt motor installation requiring an eight-pole extension from the main line feeders is about $360. Other than electrical repairs are made by a local mechanic. The power company's engineer makes frequent inspections during the operating season to see if the metering and other equipment function properly, no expense to the customer being involved.

For the safety of the pump operator it is customary to install an oil switch outside the pump house on a pole, with operation from the ground by a stick. This enables the power equipment to be completely isolated when not in use. Expulsion type fuses are installed at a low level in the pump house to facilitate replacement by the pump operator without calling upon the power company.

Quota Sheet for Employee Stock Sales

SALE of the company's preferred stock to customers is virtually a continuous operation for the Northern Ohio Power & Light Company, with headquarters at Akron, Ohio. Direct sales are made mostly by security salesmen, but company employees are depended upon to a large extent for turning in prospects, for which they receive a commission on sales closed.

To maintain interest and keep before the employees a constant incentive to turn in prospects, a monthly quota sheet such as the one shown here is used. On the first of each month blank sheets indicating each department's quota are posted in conspicuous places about the company's property. As sales are closed on prospects turned in the amount of stock sold is credited to the proper department and marked in red pencil on each quota sheet.


QUOTA FOR JAN.
SOLD 600
862
A PROSPECT CARD
HELPS MAKE YOUR DEPARTMENT QUOTA AND
MAKES YOU MONEY.
Send One In Today to the Head of Your Department

MONTHLY QUOTA SHEET FOR PROSPECTIVE STOCK SALES

The quota sheet reproduced here was for the month of January, when the total quota of 600 shares was exceeded by 262. The method of entering each department's sales is also indicated.

Duties of Commercial Representatives

DUTIES of new-business department representatives, upon whom rest the responsibility of increasing the central-station company's load and revenue, have been set forth and defined by E. F. Franklin, division manager of the Ohio Public Service Company at Warren, Ohio. Mr. Franklin believes that the territorial salesman, in addition to being the company's ambassador to its customers, must also at times represent the customer in his dealings with the company.

Each salesman must understand that he has been assigned a certain definite section of the city, including a certain definite number of customers, in which to work, and that for all intents and purposes he has been set up in business with all the machinery necessary, including a complete office in working order, a stock of goods and in fact all the machinery necessary to go into a retail business. The fact that the representatives are responsible for the sale of electric appliances to these customers goes without saying.

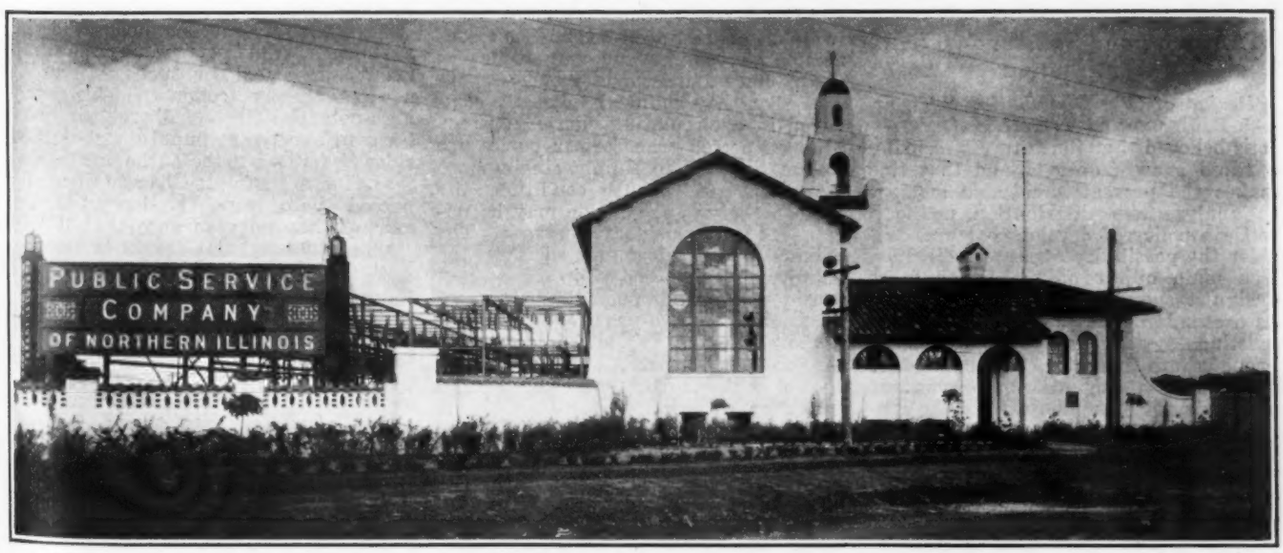
However, each utility representative should become so well acquainted with each customer's equipment and needs and the customer should become so well acquainted with him that when he needs either new equipment or advice concerning the present equipment, he will naturally turn to the territory salesman.

In addition to this sales responsibility salesmen have the responsibility of representing the Ohio Public Service Company to its customers. In fact, for all intents and purposes, as far as the customer is concerned the representative is the company when he is out on his territory, and should so equip himself that he can answer any questions that may be asked by customers concerning any operations of the company. The salesmen are to take the company to the homes of customers, and it is through them that the customer will become more favorably acquainted with the company.

On the other hand, when a representative comes to the office, he should take the position of the customer, and so far as the company is concerned, he is the customer. That is, in transmitting to the company any complaints or demands of customers, the representative should assume that he is the customer himself and knowing the general setup of the company should put forth the demand or complaint of the customer and stay with it until he gets satisfaction.

It sometimes happens that due to the organization of the company the replies to questions or services to be rendered by the company are delayed or entirely lost in the routine through which they have to go, and an ordinary customer may at times become discouraged or disgusted, because he does not understand the reason for the delay. The new-business representatives, however, are in the position of "knowing all the ropes" and for this reason should be able to get for the customer all that rightfully belongs to him, and in this way can do the customer a real service by taking his place when necessary in his dealings with the company.

Attractive Substation Feeding Railroad



SOME persons might think of a substation site next to a railroad as one of the last places to cater to the public desire for esthetic structures, but the accompanying illustration shows the type of substations which the Public Service Company of Northern Illinois has provided recently under such conditions. This is known as the Brookdale substation and feeds the newly electrified Illinois Central suburban service. It may be observed that the utility company also took advantage of the opportunity to apprise the public of the versatility of its service.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Relation of Stokers to Boilers—W. A. SHOUDY.—The correct combination of stoker and boiler cannot be determined by rule-of-thumb methods, nor can it be based upon comparisons of operation at certain percentages of ratings. According to the author of this paper, the selection must be made in the following manner: (1) Determine the number of boilers that the variations in load and local conditions demand; (2) select a grate surface of sufficient size to permit of conservative combustion rates; (3) determine the rate of evaporation that the water conditions will permit, and (4) select the most efficient heating surface that draft, coal costs and charges will permit.—*Mechanical Engineering*, March, 1927.

Three-Phase Generators for Hydro-Electric Plant.—DIPL-ING LEWINNECK.—The design of an electrical machine is dependent largely upon the type of prime movement to which it is to be coupled. In this article a review is given of the various designs of generators for use with hydraulic turbines. Details of the design problems frequently to be met in constructing a machine for a specific installation are discussed at length.—*A. E. G. Progress*, December, 1926.

Eguzon Hydro-Electric Station.—The recently constructed hydro-electric station on the river Creuse near Eguzon, in the province of Indre, was described at length some little time ago in Le Génie Civil, and the story is reproduced in the paper credited below for the information of English-reading engineers. A summary is given of the features of the station, and numerous cross-sectional views of its constructional details accompany the article.—*Engineer* (*England*), Jan. 21, 1927.

Transmission, Substations and Distribution

Design of City Distribution Systems.—J. R. BEARD and T. G. N. HALDANE.—It is believed that the future will bring a rapid growth of load and that this makes the present a suitable moment to analyze city distribution methods, settle a policy of development and consider the possibility of standardization. The main object of the paper is to design a system suitable for adoption as a standard and to consider how far existing systems may gradually be brought into line with it. The various sections of a city distribution system are reviewed in sequence from the consumer to the main transmission system, under the following headings; particular attention being given to the design of a lay-out which keeps down expense in dealing with growing loads: (a) Type and voltage of currents to be delivered to the consumers, (b) general lay-out of the low-voltage distribution system, (c) general lay-out of the high-voltage distribution system for feeding the low-voltage system to transforming centers, (d) voltage to be adopted for supplying the transforming centers from the main substations on the transmission system, and (e) size and spacing of transforming centers. The desirable characteristics are then summarized so as to outline the proposed "standard" system. Suggested standards are also laid down for the capacity of the individual parts in areas of different types and load density. In conclusion, consideration is given to the question of bringing existing city distribution systems into line with the proposed standard system, with the object of obtaining ultimately complete standardization of distribution throughout the country.—*Journal of Institution of Electrical Engineers* (*England*), January, 1927.

Merz-Price Protection for Scott-Connected Transformer Banks.—G. W. STUBBINGS.—The Merz-Price protection is only applicable in approximate form to power transformers, owing to the variable ratio of the primary and secondary currents. With certain methods of interconnecting the members of a

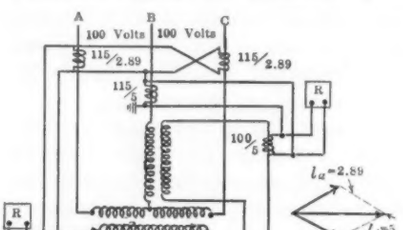


DIAGRAM OF A SCOTT-CONNECTED TRANSFORMER BANK TOGETHER WITH THE SERIES TRANSFORMER RATIOS

polyphase transformer, a phase difference exists between the two currents, and in the conversion of three-phase to two-phase by the well-known Scott connection the phases and magnitudes of the primary and secondary currents are such that they cannot be directly compared in a circulating current system. Scott-connected transformer banks are frequently used to supply single-phase networks, and in such conditions the load on the two-phase side may be unbalanced to a considerable extent. The opinion has been expressed that the validity of the method of protection just considered depends upon the balance of the load on the two-phase side, and that if the balance of this load is disturbed, the secondary currents in the protective system will not balance. The author, therefore, undertakes the consideration of the operation of this system in detail, dealing with three conditions of unbalance—a single-phase load taken from phase one only, a single-phase load taken from phase two, and a single-phase load between phases one and two of the two-phase side. Conclusions are that the Merz-Price system of protection for Scott-connected transformers is valid for all conditions of loading on the two-phase side.—*World Power*, (*England*), February, 1927.

Generation, Control, Switching and Protection

Automatic Voltage Regulators.—J. H ASHBOUGH.—The fundamental principle of regulation upon which every regulator, whether it be a voltage regulator or a waterwheel governor, is based is the reaction assisting the restoring device, causing the regulator to reach a point of equilibrium at the time the regulated quantity reaches normal. The first regulator for alternating-current machines consisted of a conventional direct-current regulator energized from the alternating-current transformer and the contact connected across the rheostat in the field of the alternator. This functioned well but was unable to handle much current on the contact and was obviously limited to only the smaller-sized units. The author traces the development of the regulator from this point through the several steps which were necessary to bring it to its present state of perfection.—*Electrical News*, (*Canada*), March, 1927.

Automatic Alternating-Current Network Switching Unit.—G. G. GRISSINGER.—The desirable characteristics of automatic switching units designed for application in secondary alternating-current distribution networks are discussed in this paper. Descriptions are given of units designed for wall mounting and for manhole installation. These units are connected to the low-voltage side of the network transformer for the purpose of automatically disconnecting a transformer from the low-voltage network whenever a fault develops on a primary feeder connected to the transformer.—*Journal of the A.I.E.E.*, January, 1927.

Units, Measurements and Instruments

Impulse Testing of Transformers.—M. WELLAUER.—In recent years buyers of power transformers demand sufficient internal coil insulation to withstand safely overvoltages with steep front waves, called impulse voltages To establish testing methods whereby a finished transformer may be artificially subjected to such stresses is not so simple as a commercial-frequency high-potential test. There are now German and Swiss impulse-test-method rules in force, but the author maintains that if a transformer has successfully passed these tests, the buyer of the machine has no assurance that it will stand actual impulse shocks in service. Tests are outlined which were made on a 3,000-kva., 60,000-volt, 16⅔-cycle transformer in accordance with the existing V.D.E. and S.E.V. impulse rules. The writer recommends an impulse test, made with an arrangement similar to that of Peek, at line voltage and 50 impulses per second for one minute for the end-turn sections, and with one-half line voltage for the remainder of the coil stack.—*Elektrotechnik und Maschinenbau*, Jan. 16, 1927.

Three-Dimensional Load Curves.—D. I. ADOLPH.—Plotting the daily load curve on heavy cardboard and cutting around its contour with scissors gives 365 diagrams per year. These can be assembled in proper chronological sequence, giving a block of charts on

which the seasonal variations of the load can be seen at a glance. The author saw such three-dimensional load curves, or, as he called them, "load mountains," at Boston and recommends their more general use. Disregarding smaller and incidental load variations, a plaster cast can be made from such an annual load block which will prove of great help for analyzing power demand.—*Elektrotechnische Zeitschrift*, Jan. 6, 1927.

Design of Current Transformers.—C. P. MELLING.—This is the abstract of a paper read before the Northwestern Students' Section of the Institution of Electrical Engineers of England last November. The paper covers briefly the theory of current transformers, methods of excitation, ratio and phase angles, discusses briefly the "through" type of transformer and closes with a summary of the factors upon which the minimum primary currents in such transformers are dependent.—*Journal of the Institution of Electrical Engineers (England)*, February, 1927.

Illumination

Economic Value of Good Lighting in Show Windows.—A. S. TURNER, JR.—The author discusses the importance from a sales standpoint of adequate illumination both in the interior of a store and in the show windows. Numerous examples are cited from past tests to show the increase in advertising and sales value brought about by improved lighting conditions. It is pointed out that the money spent for the improvement of lighting in a store should be considered by the merchants as an investment instead of as an expense. A detailed study is made of the expenses, operating costs, sales and profits of three different classes of stores. Hypothetical cases are used in each case to show the results which might be expected as a result of the improved lighting conditions.—*Transactions of Illuminating Engineering Society*, February, 1927.

Motors and Control

Problems Encountered in Electric Drives of Printing Presses.—C. KIESSLING.—The author describes certain types of electric equipment which have become common in drives for printing presses. The requirements peculiar to these installations arise in connection with the necessity for two widely different speed ranges, one for the adjustment of the paper at the beginning of a roll and another for normal operation. The operation must be stable for both of these ranges, and the automatic control must provide for a smooth variation from the lower speed into the higher.—*Teknisk Tidskrift, Elektroteknik*, Jan. 8, 1927.

Speed Regulation, Compounding and Phase Compensation in Three-Phase Induction Motors for Steel-Mill Applications.—L. DREYFUS.—Notwithstanding the remarkable simplicity of the ordinary induction motor with short-circuited secondary, it seems that it is gradually being replaced by the more complicated motor with speed regulation. The author enumerates the following advantages of the latter motor as the reasons for this change: (1) The speed-torque characteristics can be varied over a considerable range without affecting the efficiency. (2) The no-load current can be selected arbitrarily; if so desired, the motor can be used for power-factor correction. (2) The load factor can be predetermined for the entire speed range. (3) The overload capacity can be increased considerably. After a discussion of the influence of these demands upon the design, the author considers the advantages and disadvantages of the various systems of steel-mill drives in which induction motors are used.—*Teknisk Tidskrift, Elektroteknik*, Jan. 8, 1927.

Heat Applications and Material Handling

Furnace and Mine Hoists and Underground Control Gear.—W. WILSON.—Methods in use for controlling hoists are as follows: (1) Contactor controllers; (2) motor-generator system; (3) liquid controllers. The second class includes both the Ward-Leonard control and the Ilgner flywheel system. The third class may be modified by the addition of a convertor flywheel equalizer. Contactor control is available for the smaller equipment to a maximum of about 1,000 hp. As regards furnace hoists, not only is the power required comparatively small but direct-current energy may be available. For mine hoists, however, the power supply is virtually always in the form of alternating current. With furnaces the skip is required only to stop at the top and bottom of its travel and automatic control is the rule, but the latter practice is an innovation of recent date in connection with mine hoisting. The author proceeds to outline the advantages of electric operation, to discuss furnace hoists and mine hoists and to outline safety devices for both types of equipment.—*Electrical Engineer (Australia and New Zealand)*, January, 1927.

Electric Radiator Wire.—R. N. GATES.—These notes are intended to apply to wires in use as electric heating elements and controlling resistances. Two methods which are described cover the whole range of this class of apparatus but are not applicable to filaments of lamps or valves, although a modification of the second method may, according to the author, be used with fair success for this work. The first method described is suitable for wires of about No. 24 S.W.G. and upward, with a temperature range up to 1,000 deg. or even 1,050 deg. C., while the second may be used for wires of any diameter from temperatures of about 650 deg. C. to the highest temperatures obtainable in this way. The first method makes use of a thermocouple attached to the wire in a way not to upset its temperature at the point of contact to such an extent as to spoil the accuracy of the results for ordinary industrial measurements. The second method makes use of an optical pyrometer. No elaborate apparatus is necessary, and the method is capable of an accuracy of 10 deg. in 1,000 deg. C., if the correction for the exposed surface "black-body" condition is made. This is necessary, as pyrometers are normally calibrated to read correctly for "black body" conditions.—*Electrician* (England), Feb. 18, 1927.

Telegraphy, Telephony, Radio and Signals

Location of Opens in Toll Telephone Cables.—P. G. EDWARDS AND H. W. HERRINGTON.—The discussion of improved methods recently developed for the location of opens in toll cable conductors is prefaced by a review of older practices. The accuracies of calculated locations, assuming no errors in measurements, are compared for different lengths of line. The impedance bridge circuit is treated to bring out the method of obtaining a balance. The effects of several frequencies of testing potential are analyzed. The probable errors and inaccuracies of measurement which would interfere with the correct location of faults are classified and methods for their correction are developed. The accuracy of the method and the sensitivity of the apparatus are given.—*Bell System Technical Journal*, January, 1927.

Miscellaneous

High-Silicon Structural Steel.—H. W. GILLETT.—Published data on the alloying effect of silicon and manganese in steels are summarized, and tests made at the Bureau of Standards on silicon steel are given in detail, compared with published German tests and with existing specifications.—*Technologic Paper No. 331 Bureau of Standards.*

Two-Part Diagram for Electricity Supply.—D. J. BOLTON.—In this paper electricity supply is first compared with other branches of engineering and with other forms of supply with reference to the degree of capitalization. Their statistics are presented graphically, and the case for the two-part diagram is developed. A diagram is then described, illustrating the cost of electricity at each point of the supply on this dual basis, and the various uses and conclusions that can be drawn from the diagram are briefly described.—*World Power (England)*, January, 1927.

Applications of Physical Research to Technical Problems.—L. G. CARPENTER.—This is the first of a series of articles which are to appear under the same general title, and it deals specifically with the electrical breakdown of insulation. In succession the author discusses gaseous insulation, liquid insulation and solid insulation, concluding in a brief review of the three that the salient fact which emerges from such a discussion is that it is only in the case of gaseous dielectrics that anything like a really satisfactory quantitative theory has been so far evolved. In the case of liquid and solid dielectrics the phenomena are much more complex and irregular and hence safety factors have to be much increased. The author considers the problem to be intimately bound up with that of the structure of matter and believes that it provides a striking example of the tendency toward the co-operation of the physicist with the engineer in technical problems.—*World Power (England)*, February, 1927.

News of the Industry

In Congress' Last Hours

Filibuster Shuts Off Action on Walsh Motion—Colorado Permits Forbidden—Personnel Bill Fails

SUCCESS of the Senate filibuster against the motion to extend the life of the Reed campaign-investigating committee prevented, as it was intimated in these columns last week that it would do, any action at Washington on the Walsh resolution for a congressional inquiry into the financing and operation of public utility companies. It also prevented the proposed citation to the Senate of the recalcitrant witnesses called before the Reed committee.

One of the last bills passed by the Senate before the Congress came to an end was the resolution directing the Federal Power Commission to issue no permits or licenses under the water power act "upon or affecting the Colorado River or any of its tributaries in the States of Colorado, Wyoming, Utah, New Mexico, Nevada, Arizona and California, until and unless the Colorado River compact, signed at Santa Fé, N. M., Nov. 24, 1922, has been approved by the Congress of the United States, or in the event that the compact is not sooner approved, until March 5, 1929."

The resolution had support in both the upper and lower basins of the Colorado. The upper states were anxious to prevent the possibility of establishing prior rights in the lower states, and there was also the desire to make certain that no rights were acquired which would pave the way for the construction of the Boulder Dam. The resolution effectively padlocks the entire Colorado River basin. No rights may be granted on even the minor tributaries, regardless of the fact that such projects would have no bearing on the major situation.

After successfully running the blockade in the Senate, the amendment to the water-power act which would have allowed the commission to hire its own personnel failed of passage in the House.

Public Policy Committee Enlarged

Announcement has been made of the enlargement of the public policy committee of the National Electric Light Association by the addition of the following members:

P. G. Gossler, Columbia Gas & Electric Company, New York.

E. Gruhl, North American Company, New York.

George Tidd, American Gas & Electric Company, New York.

E. Groesbeck, Electric Bond & Share Company, New York.

Frank W. Smith, United Electric Light & Power Company, New York.

Paul Schoelkopf, Niagara Falls Power Company, Niagara Falls, N. Y.

R. F. Pack, Minneapolis, General Electric Company, Minneapolis, Minn.

Halford Erickson, H. M. Byllesby & Company, Chicago, Ill.

This action has been taken with a view to making the public policy committee more representative of the electric light and power industry and to assure to the association some continuity in the personnel of the committee, which has the distinction of being possibly the most important committee in the electrical industry.

Southern Industrial Conference to Meet

The second annual Southern Industrial Conference will meet in the Tutwiler Hotel, Birmingham, Ala., on March 21 and 22. The very successful and effective meeting held in Memphis last year justifies the hope that the discussions in Birmingham will mark another step in the further progress of the South toward a full realization of the benefits of its immense mineral and hydro-electric resources and possibilities. Concrete illustrations of the benefits of this work, as evidenced by new industrial plants now in operation as well as by negotiations in progress for the establishment of other new industrial activities, a review of the new resources which the year's work has developed and the possibilities of large industrial enterprises based thereon, the value of electricity in bringing about industrial development and a general discussion of the means of further benefiting the South will constitute the principal subjects for discussion. An extensive inspection trip through Alabama and Mississippi is planned.

How Congress Left Muscle Shoals

Summary of the Efforts in Both Houses to Do Something with the Government's White-Coal Elephant—Net Result Zero—House Sub-committee Records Views

BY PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

THE offer of the associated Southern power companies, which had the distinction of having made more legislative progress than any other Muscle Shoals bill, died with the Sixty-ninth Congress on March 4. During the closing weeks of Congress the military affairs committee of the House made an ineffectual effort to agree upon other legislation. The Senate committee on agriculture likewise was unsuccessful in efforts to provide for a further study of the Muscle Shoals problem or for limited government operation.

The bill containing the offer of the power companies rode through the entire session on the calendar of the two houses. It had been reported favorably on April 26, 1926, during the preceding session, which adjourned July 3. It was anticipated that an effort would be made immediately on the convening of Congress last December to put through this bill, which provided for the public utility use of such power as would not be utilized in production of fertilizer. The power companies had organized a subsidiary fertilizer company which was prepared to build an entirely new nitrate plant to use the Haber process. The measure, however, was opposed very actively by Alabama and Tennessee interests and by others who were anxious to have the power used at or near Muscle Shoals. There was strong demand from adjacent states for the distribution of the power, but the bill did not have sufficient support behind it to overcome the opposition to its consideration.

Senator McNary, chairman of the committee on agriculture, which had jurisdiction, was insistent from the beginning of the session that the bill be recommitted to his committee. This was vigorously opposed, however, by Senator Harrison of Mississippi, who favored the power companies' bill. Late in the session, however, when it was apparent that no action could be had on the bill before the Senate, the measure was recommitted. Senator McNary then brought out a plan for a further study of Muscle Shoals by a joint congressional committee. This was opposed on the ground that Muscle Shoals had been investigated and reinvestigated.

Some Senators were of the opinion that a study by the government's own experts might result in a practical recommendation. Those favoring the McNary resolution, however, opposed this plan and also opposed a compromise plan naming the Secretaries of War, Agriculture and the Interior as ex officio members of the joint committee. Senator Norris then brought out his resolution proposing a limited period of government operation. That measure, which was much more generally supported, was suspected by some members as being the entering wedge for continuous government operation of the properties.

As a result no legislation of any kind was passed. The House sub-committee did submit a report in which it was stated that neither the Slemp offer nor the Cyanamid offer was acceptable. In

its report to the full committee the sub-committee recommended that, unless by the time Congress convenes for its next session a bid is received which meets the requirements more fully and more satisfactorily than those heretofore submitted, "an effort should be made to secure an operating contract for the production of fertilizer at Muscle Shoals, and in default thereof this committee should give the matter of operation at Muscle Shoals by a government corporation full and careful consideration."

The sub-committee also expressed the opinion that no preliminary permit under the water-power act should be granted at Cove Creek or any other point which might affect the Muscle Shoals project until after the expiration of the next session, recommending in this connection that the Secretary of War be requested to allot a sufficient amount from available funds for the government engineers to make a preliminary investigation and survey of the Cove Creek dam proposition, and that such work be actively prosecuted so that a report to Congress can be made thereon.

In the Legislative Mill

Water-Power Legislation Still Hangs Fire in New York—Metcalf Bill Beaten in Washington—Tennessee May Set Up Power Commission—Indiana Fight Brisk

INTERPARTY negotiations between Governor Smith of New York and the spokesmen for the Republican majority in the Legislature have not as yet ended the deadlock over legislation to form a commission to inquire into the hydro-electric situation in that state, including the proposed St. Lawrence River development. The Governor is said to insist that any commission set up shall report yes or no on the feasibility of his plan for a state water power authority. His opponents want an investigation and report on the comparative advantages of private and public development. On the details of less important features of any bill to establish this commission no difficulty in reaching a compromise is said to be apprehended.

Authority to initiate rate inquiries will probably be granted the Massachusetts Department of Public Utilities at the present legislative session, as Governor Fuller and the companies are in favor of this extension of power and the board has sought it for several years. Two amendments have been proposed, however, by the Massachusetts Gas and Electric Association, first, one permitting lighting companies to make long-term contracts for bulk supply of energy without regulation by the commission, and, second, one allowing emergency rates to be established on short notice with the approval of the department. The McGlue bill, which would have allowed cities and towns to embark on municipal ownership of lighting plants at a day's notice and on a single vote, will be withdrawn by permission of the committee on public lighting.

In Connecticut a bill has been introduced by Senator Redden of Bridgeport giving the Public Utilities Commission jurisdiction over security issues of utility companies.

Three Senate bills authorizing New Jersey to enter an agreement with New York and Pennsylvania allocating the waters of the Deleware River are favored by the Senate judiciary committee, but there seems to be no likelihood of their adoption, public hearings and the opposition of Trenton, reported on page 519 last week, having changed a previously favorable outlook.

The Metcalf power bill, permitting cities of the first class to sell electric power outside their corporate limits, was killed in the Washington State Senate last week by a vote of 25 to 16. This bill, introduced for the fourth time in as many sessions of the Legislature, would have permitted cities with municipal plants to sell energy to other cities within 50 miles of their corporate limits and 25 miles from their transmission lines and to private concerns within 15 miles of their transmission lines and 10 miles of their city limits. A tax of 5 per cent on gross earnings was provided on all power sold outside the city except to other municipalities.

A bill to create a waterway and power commission for Tennessee to have jurisdiction over leasing sites and construction of power dams will be introduced by Representative B. S. Williams on reconvening of the Legislature. The Governor, Secretary of State and Attorney-General will constitute the commission under the bill. Its jurisdiction will be confined to non-navigable streams.

The General Assembly of Virginia will be asked at a coming special session to amend the charter of the city of Richmond to permit that city to sell gas, water and electricity by wholesale or in large quantities to individuals or groups, and to authorize the city to install and equip factories, manufacturing plants and other structures with appliances for the use of gas or electricity for manufacturing purposes or for supplying fuel or motive power for refrigeration plants for private homes.

Despite united protests of public utility companies, the taxation committee of the Ohio Senate has voted to recommend the Kumler excise tax bill increasing the rate on utility corporations from 1.2 to 1.5 per cent on gross receipts. According to counsel for the Committee on Public Utility Information, the proposed rate would mean that utility companies would by 1935 have to pay an increase of 554 per cent in taxes as compared with 1925.

War over the Indiana Public Service Commission went merrily on in the Capitol at Indianapolis, with much recrimination between House and Senate, until the session ended on Monday. Efforts in the House to abolish the commission ended in gesture, but it passed by a vote of 74 to 2, though with amendments, the Nedjl Senate utility measure providing for review by the circuit or superior courts of all orders of the Indiana Public Service Commission. Proceedings appealed are by this measure to be tried by the judge without a jury, and if during the trial the appellant introduce evidence found by the court to be different from or additional to that offered before the commission, the latter is to have an opportunity to amend its order. On the commission's failure to do so in accordance with the new evidence, the court may order the commission to comply.

The Indiana House also passed, by 87 to 2, the Harlan Senate bill requiring the Indiana Public Service Commission to inquire into attorneys' fees or promotion charges included by utilities in rate cases and into the management of any public utility. The Inman measure, which provides that the Attorney-General shall assign a member of his staff to the Public Service Commission to handle public utility cases and authorizes him to employ such assistants as he may deem proper, was passed by the Senate by 28 to 18.

In Oklahoma City on March 4 the Lower House of the Legislature struck the revocable permit repeal bill from the calendar, finally killing the repeal movement. The vote stood 50 to 44. The bill had previously gone down to defeat in the Senate.

The signing by Governor Dern of Utah of Senate bill No. 12, introduced by Senator Auerbach, which clarifies Utah's stand on the navigability of the Colorado and Green Rivers, places the state on record as opposed to any interpretation of the seven-state compact that would declare the streams unnavigable and emphatically declares the contrary.

Hydro Applications Up

Federal Power Commission Extends Time for Priest Rapids Project—Permit Sought for Gila River

DEFERMENT of the construction period for two years has, as predicted, been allowed by the Federal Power Commission to the Washington Irrigation & Development Company in connection with its license for the development of Priest Rapids on the Columbia River. The license prescribed that the construction work should commence on or before March 5, 1927, and be completed to a capacity of 320,000 hp. on or before Dec. 31, 1931.

R. H. Woods of Lordsburg, N. M., has applied to the Federal Power Commission for a preliminary permit covering a project on the Gila River in Hidalgo and Grant Counties, N. M. The plan contemplates the construction of five power houses and storage reservoirs. This would make available 50,000 hp., it is estimated.

The city of Allegan, Mich., has applied for a preliminary permit covering a project on the Kalamazoo River in Allegan County. The application conflicts with that of the Fargo Engineering Company.

A license has been issued to the Pacific Gas & Electric Company covering its constructed electric plant on the Mokelumne River.

The commission has canceled the preliminary permit extended Nov. 6, 1925, to the Appleton Land, Power & Water Company of Los Angeles. The permit covered a project on Deep Creek in San Bernardino County. The cancellation was asked by the applicant.

The commission has authorized the issuance of a license to the Alturas (Cal.) Electric Power Company covering a 250-hp. constructed project in Modac County. It is planned to build a diversion dan. in Pine Creek.

The Alaska Consolidated Canneries, Inc., of Seattle, Wash., has applied to the Federal Power Commission for a license to cover its constructed plant on Prince of Wales Island, Alaska. The primary capacity is less than 100 hp.

The Southern Sierras Power Company of Riverside, Cal., has applied for a license to cover a transmission line 67 miles long from San Bernardino to Rincon.

James G. Dehy of Mocalno, Cal., has applied for a preliminary permit covering a 300-hp. project on Cottonwood and Lone Tree Creeks in Mono County, California.

The Utah Power & Light Company of Salt Lake City has applied for a license to cover 82 miles of transmission line extending from its Wheelon switchboard to the American Falls plant.

Oklahoma Utilities Meet

Responsibility of Management to Serve the Public Accented—Papers and Lectures Presented

INDICATIONS at the end of the second day of the ninth annual convention of the Oklahoma Utilities Association, which convened March 8, indicated an attendance exceeding 800. Several men of national reputation in the industry, including Martin L. Pierce, North Canton, Ohio, director of research the Hoover Company; Dr. R. W. King, New York, American Telephone and Telegraph Company; Frank LeRoy Blanchard, New York, president Public Utilities' Advertising Association; Lucius S. Storrs, managing director American Electric Railway Association; Earle W. Hodges, New York, director public relations Henry L. Doherty & Company, and W. S. Vivian, director of public relations Middle West Utilities Company, chairman of the speakers' bureau of the N.E.L.A., were on the program for the first two days and speakers of equal note were scheduled for the last day. J. A. Frates, president of the association, presided.

Afternoon meetings were held by each of the six divisions: Electric light, gas, electric railway, telephone manufacturers, suppliers and public relations. On the afternoon of March 9 all of these groups met in the leading hotels and conferences of the Oklahoma speakers' bureau and the state women's public utility information committee also were held. It was reported at the speakers' bureau conference that 1,001 public utility talks and plant visits were made in Oklahoma during the past year.

Electric railways today have only 4 per cent less mileage than during the most prosperous period of the industry, Lucius S. Storrs declared, lines having been abandoned only in towns of less than 8,000 population, where they were never badly needed. Frank LeRoy Blanchard of New York stated that if utility companies expect to retain the good will of the public they must not only give good service but at reasonable rates and take the public into their confidence. The growth of utility advertising in newspapers and other public relations work shows that results are being obtained. The moral responsibility of management was described by Martin L. Pierce, who declared that 80 per cent of the moral effectiveness of employees rested with proper management. He also charged against improper management the huge industrial cost of turnover.

G. W. Robinson of St. Paul, vice-president and general manager of the United States Independent Telephone Association, spoke briefly in extending the greetings of his association.

Transoceanic telephony was fully described in an illustrated address by D. R. W. King, New York American Telephone & Telegraph Company.

The division meetings were addressed principally by state leaders in the various branches of the industry. Ample time was allowed for discussion.

Utility Merchandising Practices Challenged

Commercial Section Meeting in Chicago Featured by Meeting of Hardware and Furniture Dealers with Utility Sales Managers—Eighteen Committees Discuss Commercial Problems

THE sales managers of the power industry gathered this week at the Edgewater Beach Hotel, Chicago, for the regular spring meeting of the N.E.L.A. Commercial Section and gave still further evidence of the new spirit that has come into this branch of the association. With a registration of nearly 150, the commercial problems of the central stations were discussed by eighteen committees.

C. E. Greenwood, chairman of the general merchandising committee, held a conference on Wednesday morning in which the members of the sub-committee on trade relations met with several officials of the national associations of hardware dealers and furniture dealers to discuss the growing criticism of central-station merchandising methods by local dealers. President Beatty and his associates of the Hardware Association compared the policy of the regular merchant and the power companies in installment selling. The hardware man does not believe in selling small articles on easy payments, they said. Standard practice is to require at least 25 per cent of the sale price in the down payment and to extend the installment periods over one year. The power company, on the other hand, is offering flatirons for as low as 45 cents down and 50 cents a month and is featuring as premiums expensive articles such as a carving set with a toaster and a kitchen ladder with a clothes washer. The market value of these premiums is very often exaggerated as an inducement to buy. Such free goods and gifts of extra time to pay are virtually price cutting which the dealer cannot meet and which the utility, if it kept a strict merchandise account, could not meet either. This practice they said embraces the entire country and is demoralizing values and injuring the trade.

The hardware industry believes the central station should find its chief interest in developing the sale of current-consuming appliances throughout all retail outlets. The problem is to evolve some plan to get the greatest possible number of dealers to push electrical household equipment. The dealers do not object to drives on sale merchandise if prices are not cut, but the dealer should be able to participate in the drive. There is no criticism of the power company selling large appliances on easy payments, they said, and it may not be wise to limit payments on large units to twelve months' time during the pioneering period. Care should be exercised, however, that the public be not led to infer that the power company has the right to cut off service for failure to pay an installment on the purchase of merchandise, as has at times occurred.

Secretary Rowell of the Furniture Dealers' Association cited instances of dealers who had sold the full line of small appliances, later being obliged to discontinue because the power company constantly cut prices. Clyde Chamblin, speaking for the Association of Electragists, urged a closer co-operation between the power company and the dealers of the community. In San Francisco, he said, the central station calls in the dealers before launching a campaign and discusses details in advance so that there is no unfair competition.

Chairman J. E. Davidson expressed the desire of the power industry that the dealers may participate in the appliance trade and prosper. The central stations, he said, believe in selling at list. Some companies may go too far in terms and prices just as some department and hardware stores exploit bargains, but the obvious interest is to develop the greatest possible number of retail outlets. E. W. Lloyd recommended that the committee endeavor to function as a clearing house to investigate the complaints of dealers and endeavor to secure correction of unfair merchandising practices wherever found.

The interest and responsibility of the sales manager for the guidance of rates was emphasized in a spirited meeting of the promotional rates committee. Chairman T. F. Kennedy reported on a conference with the rate research committee for the discussion of the needs for revising rate schedules to stimulate market development. E. W. Lloyd stressed the importance of building up residence consumption to the point of 500 kw.-hr. per home per year, beyond which cooking, water heating and other heavy appliances begin to enter into the installation. The range commit-

tee is compiling data of successful sales plans and reporting on the cost of wiring for ranges with recommendations which will embrace demand factor, grounding, standardized plugs for ranges and the promotion of range wiring in new buildings. The newly formed committee on electrical advertising, embracing electric signs, illuminated billboards, floodlighting and window displays, is making a general survey of the fields open to electrical advertising and working to develop a definite selling plan to be used by utilities. The consideration of the problems of competitive power drew a large attendance and lively discussion that proved how far even the older phases of this subject are from being settled. Service to hotels and office buildings, laundries, packing plants and paper mills have engaged the interest of the committee for some time, but they are still live topics. Bleeder-type and low-pressure turbines received considerable attention, also the competition of isolated plants operated on waste heat from industrial processes such as cement burning, steel making and the production of earth products. Diesel and oil engines were discussed at length, and recognizing fully their importance it was agreed that the situation had been beclouded with an emotional factor that had rather magnified its true relation. Need was expressed for a more effective use of data on power sales problems that are published in the press, and the committee will prepare a bibliography. The growing importance of utility tie-in with industrial plants was stressed. The home-lighting committee featured a display of popular-priced lighting fixtures and shades. The responsibility of the power company to take leadership in the refixturing of the seven or eight million homes that need refixturing was presented by Earl Whitehorne. Burke Corcoran made a plea for a closer co-operation between utilities and contractor dealers in all refixturing campaigns. The committee voted a recommendation that the central stations should proceed actively to awaken a fixture conscientiousness in the home and carry forward the development of this market. Meetings of the other committees occurred too late for this issue and will be reported next week.

N.E.M.A. Program Ready for Next Week's Meeting

Next Thursday and Friday, March 17 and 18, the initial meeting of the Policies Division of the National Electrical Manufacturers' Association will be held at Briarcliff Lodge, Briarcliff Manor, N. Y. The board of governors will meet on Thursday morning, and in the afternoon the first general session will be held, C. L. Collens discussing the association's place in the industry, President Gerard Swope industry statistics and S. L. Nicholson regulatory legislation. James A. Farrell, president United States Steel Corporation, will speak at the evening dinner on "Solving Industry Problems by Group Action."

For the second morning these addresses are scheduled: "Competition in Restraint of Profits," C. L. Collens; "Cross-Licensing of Patents," Robert A. Brannigan; "Manufacturers' Initiative in Code Changes," A. Penn Denton, and "Present and Future Business Policies," N. A. Wolcott.

Group meetings will be held in the afternoon, including one of the new Radio Division, with Vice-president L. B. F. Raycroft in charge.

Independent Study of Rates

Copper and Brass Research Association Makes National Survey Showing Reductions in Five Years

RATES for electric energy in more than half the homes of the United States are 15 per cent lower than in 1921, according to a survey just completed by the Copper and Brass Research Association. Consumption of power in the United States has doubled during this five-year period, the survey points out. Not more than one-third of the 15,000,000 homes estimated to be using electricity today are adequately wired to develop the full convenience of electric light, heat and power, according to the association. In 1921 only eight million homes were wired for electricity. "As the cost of electrical energy becomes cheaper and the use of appliances in the home increases, the problem of rewiring houses equipped with inadequate systems designed mainly for lighting becomes greater, to provide maximum safety and convenience," the survey states.

RESULTS OF SURVEY IN THIRTY STATES

	Reduction 1921-1927, Per Cent.	Average Monthly Bill 30 Kw.-Hr.		Reduction 1921-1927, Per Cent.	Average Monthly Bill 30 Kw.-Hr.
Alabama	25	$3.16	Tennessee	5	$3.58
Arizona	20	3.75	Vermont	10	3.00
California	28	2.66	Virginia	2	3.64
District of Columbia	25	3.90	West Virginia	8	2.92
Indiana	15	2.61	Wisconsin	20	3.35
Maryland	12½	2.64	Colorado	*	3.32
Massachusetts	15	3.42	Georgia	*	3.51
Michigan	10	2.52	Kansas	*	2.50
Missouri	15	3.14	Maine	*	....
New Hampshire	10	....	Minnesota	*	3.32
New Jersey	20	3.59	Nevada	*	3.00
New York	12	3.91	Ohio	*	2.74
North Dakota	35	3.70	Oregon	*	....
Pennsylvania	10	2.98	Utah	*	....
Rhode Island	12½	3.78	Wyoming	*	3.00
			Average	15½	$3.24

* No change.

Reports compiled by the association from public utility commissions of 30 states indicate marked decreases in rate schedules of both hydro and steam power electric companies. Twenty of these states, representing more than 50 per cent of consumption in the United States, show decreases during the past five years averaging 15 per cent. Ten states, with rates below the average for the entire country, made no changes in their basic schedules for home consumption. The trend of power rates over the United States appears to be in the direction of a mean level of $3.25 for the average monthly bill in the home equipped with the present number of appliances and lighting facilities. This leveling process, the survey says, is shown decidedly in states like California, Alabama, Maryland, Massachusetts, New York, Washington and other states where water and fuel power come into competition. Further rate reductions have been indicated for 1927 in New Jersey, Rhode Island, California, District of Columbia and Maryland. Rates in Maine, supplied almost exclusively by hydro-electric power, have been maintained at a level with no increases, according to the Public Utilities Commission there. In Utah the rates have remained unchanged since 1917, the state commission reports.

A.I.E.E. at Kansas City

Program for the Regional Meeting to Be Held in Western Missouri on March 17 and 18

A PROGRAM of unusual interest to members of the Southwestern District of the American Institute of Electrical Engineers will be presented at the regional meeting to be held in Kansas City, Mo., March 17 and 18, under the direction of District No. 7. The Kansas City Athletic Club, at Eleventh Street and Baltimore Avenue, will be headquarters for the meeting, and technical sessions will be held in the Roof Garden of this club.

Subjects covered in the program will include mercury-arc rectifiers, automatic substations, application of electric power to flour mills and the petroleum industry, and railway signaling. A meeting of the student counselors and student chairmen is to be held March 16, on the afternoon before the regional meeting opens, for the purpose of discussing student activities. There will be an informal banquet on Thursday evening, a luncheon with the Kansas City Electric Club on Friday and a dinner at the Northeast station of the Kansas City Power & Light Company on Friday evening. Trips of inspection to this station and the company's automatic substations and also to grain elevators, flour mills, stockyards and the plant of the Sinclair Oil Company have been arranged.

The technical program follows:

THURSDAY, MARCH 17

Morning.—Address of welcome, A. E. Bettis, vice-president Seventh Geographical District, A.I.E.E.; "Current Analysis in Circuits Containing a Resistance Modulator," L. S. Grandy, University of Missouri; "Development of Railway Signaling," T. S. Stevens, Atchison, Topeka & Santa Fe System.

Afternoon.—Automatic Substation Session: "A 21,000-Kva. Automatic Substation," D. W. Ellyson, Kansas City Power & Light Company; "Inspection, Maintenance and Test of Automatic Substation Equipment," Chester Lichtenberg, General Electric Company; "Carrier-Current Selector Supervisory Equipment," C. E. Stewart and C. F. Whitney, General Electric Company.

FRIDAY, MARCH 18

Morning.—Mercury-Arc Rectifiers Session: "Mercury-Arc Rectifiers," O. K. Marti and Harold Winograd, American Brown Boveri Company; "Steel-Tank Mercury-Arc Rectifiers," E. B. Shand, Westinghouse Electric & Manufacturing Company; "Application of Mercury-Arc Power Rectifiers," C. A. Butcher, Westinghouse Electric & Manufacturing Company.

Afternoon.—Oil and Milling Industries Session: "Application of Electric Power to the Petroleum Industry," B. K. Howard, Texas Power & Light Company; "Electricity for Oil-Well Drilling," L. J. Murphy, Westinghouse Electric & Manufacturing Company; "Electric Welding of Pipes," J. F. Lincoln, Lincoln Electric Company; "Electricity in the Milling Industries," G. C. Meyer, Kansas City Power & Light Company.

Detroit Edison's Program

Thirty-two Million Dollars Budgeted for Construction Purposes in 1927 —Delray Station No. 3

WITH a construction budget for 1927 which may run to $32,000,000, the Detroit Edison Company has started on another active year. During 1926 its power-plant capacity was increased by 130,000 kw. by additions at Trenton Channel and Marysville, permitting the withdrawal from active service of the old vertical turbines in Delray power house No. 2.

Work has been started on the foundations of Delray No. 3, which is to house at the start two 50,000-kw. turbo-generators. Final decision between stoker firing and pulverized coal has not yet been made. About $1,500,000 is to be expended on this project in 1927. The plant will go into service in 1928 and cost perhaps $9,500,000 for the 100,000-kw. installation. Five million dollars will be spent to complete the work on units Nos. 4 and 5 at Trenton Channel and to install unit No. 6, raising the capacity of the station to 300,000 kw., but only half of this will be spent this year. A fifth unit, a 30,000-kw. machine, and a boiler are to be installed at Marysville at a cost of $1,900,000, making that plant's rating 110,000 kw.

The substation program calls for the erection of two large structures in Detroit at a cost of $1,100,000, and $1,250,000 will be required to increase the rating of two existing substations. Other expenditure on substations will much exceed $1,000,000, and $5,000,000 is appropriated for underground cables and conduits. Forty-five miles of standard 120-kv. two-circuit, steel-tower transmission extending from Superior to Cement City will form part of the interconnection with the Consumers Power Company at Jackson which has already been described in these columns. Other overhead-line expenditure, distribution lines, short extensions, transformers and meters will, it is estimated, take another $5,000,000. The rest of the budget is accounted for by heating-plant additions, purchase of sites, an extension to the service building and new commercial offices.

For International Agreement on Rating of Rivers

Definite steps have at last been taken to organize a committee in this country to operate through the International Electrotechnical Commission in an attempt to bring about an international agreement on the rating of rivers. The United States National Committee of the International Electrotechnical Commission has appointed N. C. Grover, chief engineer of the United States Geological Survey, as chairman of an advisory committee. Mr. Grover has recommended the appointment of the present sectional committee of the American Engineering Standards Committee for membership in this new advisory committee. The International Electrotechnical Commission besides asking Mr. Grover to act as chairman of the advisory committee has requested him to be the director of the secretariat, which will conduct correspondence with smaller groups in foreign countries. This places the United States group in the position of initiating and, to that extent at least, of controlling the international deliberations on this question.

America to Be Represented at Volta Centenary

Thomas A. Edison will be honorary chairman and Maurice A. Oudin, vice-president International General Electric Company, chairman of a committee which has been formed by Italian-American and electrical interests to represent America at exercises commemorative of the death of Alessandro Volta on March 5, 1827. The exercises will be held at Como, Italy, Volta's native city, in June, when exhibits from all over the world will be shown there.

"Representing interests which owe a debt to Volta, we think it appropriate that Americans should create some memorial to him," the committee in charge said in a formal statement. "It is proposed that this memorial should take the form of an annual fellowship to an Italian electrical engineer, enabling him to spend one year in the United States in study and research. It is hoped that the announcement of the establishment of the fellowship may be made at the June meeting in Como."

Cut in Chicago Water Diversion Would Affect Power

Presentation of testimony in the hearings conducted by Charles E. Hughes on the petition of Wisconsin and five other states to restrain the Illinois Sanitary District from alleged illegal diversion of water from Lake Michigan will be concluded April 2 in accordance with an agreement reached.

Edwin J. Fowler, statistician for the Commonwealth Edison Company, who was a witness last week, declared that that company would be greatly hampered in obtaining water for some of its steam plants in Chicago if diversion from the lake were cut in half. "The industrial and commercial life of Chicago would be thrown out of alignment for a period of three to five years if reduction in diversion were ordered," the witness maintained. "It would require that period at least to construct new plants and make new arrangements which would become necessary because of the lessened availability of water. Limitation of the generating capacity of the Commonwealth Edison Company would not only reduce the supply of energy available for the use of private consumers in lighting and heating their homes, but would result in fewer street cars and lower operation of electrically driven traffic generally."

The witness estimated that the cost of a new power plant and equipment, such as would be necessitated by a cut in the diversion rate, would be $171,000,000 and that the company's increased operating expenses would approximate $9,000,000 annually. "This added cost," he said, "would chiefly be due to enforced consumption of larger quantities of coal."

Tennessee Legislators Study State Water Power

The recess committee of the Tennessee Legislature appointed to investigate the power situation in Tennessee and related territory recently inspected the hydro-electric plants in Tennessee and Alabama. The main object the committee had in making this investigation was to collect information that will assist it in formulating a legislative program under which Tennessee can go forward with the development of its water powers. While in Alabama the committee inspected the hydro plants at Lock 12, Mitchell Dam, Lock 18 and Martin Dam, as well as the Gorgas steam plant of the Alabama Power Company and the hydro-electric and nitrate plants at Muscle Shoals. Going to Chattanooga, the legislators journeyed along the Clinch River to the site of the proposed Cove Creek Dam, where there is said to be a much greater storage capacity than that existing at Muscle Shoals.

Senator John Shelton, chairman of the Tennessee visiting committee, declared that the close connection between the Alabama enterprise and the delayed development of the proposed hydro-electric plants on the Tennessee and the Clinch Rivers called the committee to take a determined stand in defense of the water-power resources of their own state. Some members of the committee discussed with favor the bill for leasing Muscle Shoals to the associated power companies. Others are for government operation.

Maryland Public Utility Men Meet at Baltimore

Fourteen speakers read papers on various phases of public utility operation before 250 members of the Maryland Association of Public Utilities assembled in their fifth annual convention at the Hotel Emerson, Baltimore, on March 4. G. P. Mangan of the Potomac Electric Power Company opened the convention with a discussion of electric utility operation. Other speakers were H. Carl Wolf, chief engineer of the Public Service Commission; J. S. Cruikshank, Johns Hopkins University, and W. C. Humm of the Potomac Edison Company.

At the afternoon session there were addresses by R. Paul Smith, president of the association; F. D. Pembleton, Public Service Electric & Gas Company, Newark, N. J.; Miss Helen E. Steiner, Cleveland, and Earle W. Hodges, of H. L. Doherty & Company, New York. A dinner, with George W. Williams as toastmaster, was held in the evening. Mayor Jackson, City Comptroller Graham, J. Frank Harper, member of the Public Service Commission; John N. Mackall, chairman of the State Roads Commission, and A. K. Baylor of New York made addresses. Governor Ritchie was unable to be present because of illness.

Officers elected for the ensuing year are: President, H. B. Potter, Baltimore; vice-president, H. T. Connolly, Baltimore; treasurer, H. A. Brooks; secretary, G. S. Williams.

Purchases and Mergers

Numerous Small Transfers Are Made or Contemplated in the East, Middle West and South

AS A RESULT of a proposal by the Lynn Gas & Electric Company, the town of Marblehead, Mass., is considering the sale of its 600-kw. generating plant and the purchase of electricity. The plant is connected with the Lynn company's system by a tie line. The Lynn company has offered to buy the plant on a basis advantageous to Marblehead and will soon present a definite offer for consideration at town meeting.

The New York State Gas & Electric Corporation has been authorized by the Public Service Commission to acquire all the capital stock of its subsidiary the Staten Island Edison Corporation.

A certificate has been filed in the office of the Secretary of State of New York merging the Sanborn-Pekin Power Company, Inc., with the Niagara, Lockport & Ontario Power Company.

Purchase of six municipal electric lighting plants during the last twelve months has been reported by the Eastern Shore Gas & Electric Company. These plants were at Dagsboro, Frankfort, Millsboro, Selbyville and Smyrna, Del., and Cape Charles, Va. They will be served mainly from the Eastern Shore's transmission lines.

The Omaha & Lincoln Railway & Light Company, which has headquarters at Ralston, an Omaha suburb, has disposed of its electric light properties, including a power development on the Platte River at Ashland, to the Nebraska Power Company, which serves Omaha. The company was one of the late Senator McKinley's properties.

After refusing by an almost unanimous vote to sell its electric plant, the city of Alma, Neb., is advertising it for sale at auction on March 29. Active competition is expected. The Western Public Service Company, a prospective purchaser some months ago, has posted a check for $108,000 as its initial bid.

The Rural Light & Power Company of Muncie, Kan., has been purchased by the Kansas City Power & Light Company, which had previously supplied it with energy, for $35,000.

The municipal distribution system at Ash Grove, Mo., will be sold to the Electric Utility Company, a subsidiary of the Empire District Electric Company, in accordance with a recent two-to-one vote of the citizens.

The Village Board of Sun Prairie, Wis., has taken under advisement an offer to the Wisconsin Power & Light Company to buy the municipal electric plant and distribution system for $45,000.

The Sauk County Utilities Company, Baraboo, Wis., serving a wide rural area, has been purchased by the Wisconsin Power & Light Company, from which it had previously bought energy at wholesale.

Merger of the Minnesota Power Company of Excelsior, Minn., with the Northern States Power Company is announced by H. M. Byllesby & Company. The Minnesota Power Company serves communities with a combined population of about 12,000 in the district surrounding Lake Minnetonka.

An election is to be held soon at Kissimmee, Fla., to decide whether the municipal light plant shall be sold to the Florida Public Service Company, which has offered $400,000 for it.

The Baker County Power Company has made an offer to buy the municipal power plant at Moultrie, Ga., at a rumored price of $125,000. City officials say no sale will be made without the consent of the voters at a special election. The Baker County Power Company is also said to be trying to buy the municipally owned plants in Camilla, Sale City and Doerum.

The Texas Power & Light Company of Dallas has purchased the properties of the Midland (Tex.) Light Company in Midland, Stanton and Odessa. The Midland company operated a generating plant in Midland that supplied energy to Odessa and Stanton. The Texas Power & Light has also purchased the lighting plant at Venus, Tex.

Briefer News

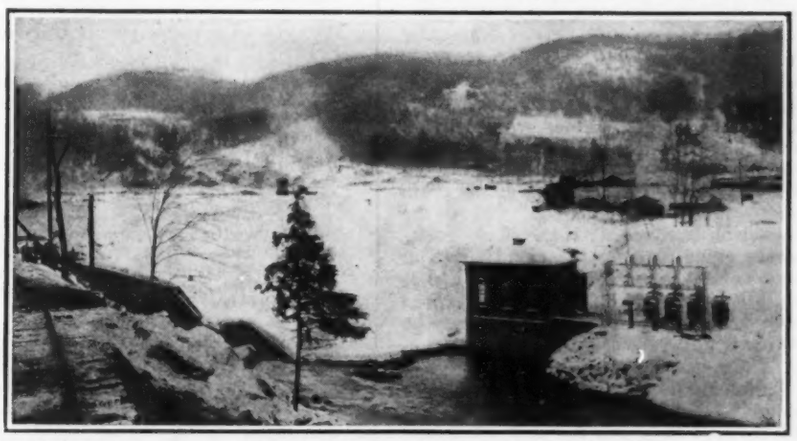
The Harley Clarke Libel Suit at Indianapolis.—The demurrer of Alva J. Rucker, formerly Corporation Counsel of Indianapolis, to the complaint of Harley L. Clarke of Chicago, utility president, who filed a damage suit for $250,000 in a federal court, charging Rucker with libel, has been sustained, the court holding that irrelevancy of the statements complained of must be shown in making a libel charge of this nature. Clarke received twenty days in which to file an amended complaint. The libel suit grew out of the conspiracy suit, dismissed for lack of jurisdiction in the Superior Court in Indianapolis last fall, in which Rucker charged Clarke with participation in political misdeeds.

Vast Potential Capacity of Water-Power Sites Applied for in Western Canada.—Application for permits to develop hydro-electric power in western Ontario and northern Manitoba are on a scale that represents an ultimate volume of 5,000,000 hp. These cover territory all the way from the Lake of the Woods country to the basin of the Nelson River and relate to pulp and paper mills, mining plants, civic hydro promotion and transportation projects.

Hydro-Electric Plant to Serve Texas Panhandle Projected. — The Central Power & Light Company, which has an electric generating plant in Childress, Tex., is jointly with that city making a survey with a view to building a large surface-water reservoir on Mountain Creek just south of Estelline. It is estimated that a lake can be formed with a capacity of more than 8,000,000,000 gal. and that a hydro-electric plant at that point could supply energy to Childress and other towns in the Texas Panhandle. The total investment is put at $3,500,000.

Iowa Power Conference to Be Held at Dubuque.—Development of Iowa's power resources and associated matters will be discussed at a conference to be known as the Iowa Power Conference, to be held at Dubuque on March 30 and 31, under the auspices of the College of Applied Science of the University of Iowa. Public utility heads, municipal officials, manufacturers and engineers are expected to attend. The program, according to Dean C. C. Williams, will

Sherman Development on Deerfield River in Service



A 9,000-KVA. automatic hydro-electric station, known as the Sherman development of the New England Power Company system, went into operation recently on the Deerfield River, about two miles south of the Davis Bridge plant of that company, near the Vermont-Massachusetts border. The plant operates under a mean head of 78 ft., and the generated energy is stepped up to 110 kv. and transmitted to Davis Bridge for delivery into the system. The power house is at the base of an earth dam 100 ft. high, 540 ft. wide at the base and 25 ft. wide at the top, the crest being 720 ft. long. One unit completes the installation, which enables the full discharge from the Davis Bridge station to be utilized by No. 5 station below by means of the storage.

The concrete wall at the left of the picture is one side of the spillway channel. Just at the right of this wall is the discharge end of the by-pass tunnel which took care of the river flow during construction. The plant was built by the New England Power Construction Company, Worcester, Mass.

include discussions on the utilization of the coal of Iowa, the power now available in Iowa, power rates, and the possibilities of steam and water-power generation in the state.

Union Bag & Paper Company Will Extend Its Hudson River Enterprise.—Glens Falls, N. Y., has been selected by the Union Bag & Paper Company as the site for a proposed hydro-electric plant to develop 50,000 hp. and cost $3,000,000. The company's existing dam at Sherman Island, above Glens Falls, has an equivalent capacity. A 74-ft. fall for the new plant is obtainable. Power would, it is understood, be sold to the Adirondack Power & Light Corporation, as is the case at Sherman Island. The assertion is made that the new site involves the last major water-power facility on the Hudson River.

St. Louis Central-Station Company Loses Taxation Suit. — The Missouri Supreme Court has quashed a writ of certiorari previously issued by the court in the proceedings instituted by the Union Electric Light & Power Company of St. Louis against the State Board of Equalization. The effect of the Supreme Court's action is that the assessment of $21,000,000 made against the company's properties will stand. The company protested against the assessment, which tripled its taxes as compared with 1923, the year in which the law was altered, as unjust, illegal and void. The case was reported in the ELECTRICAL WORLD for Nov. 13, 1926 (page 1032.)

New Cable from the United States to Germany Is Inaugurated. — The new Emden-Azores-New York cable, which re-establishes direct cable communcation between Germany and the United States for the first time since it was interrupted by the war, was formally opened on March 4 by an exchange of messages between Presidents Hindenburg and Coolidge. The speed of this cable is greater than the combined capacities of the two cables which linked the two nations before the war. The new service was made possible by the completion of the German cable from Emden, to Horta, Azores, where the connection is made with the New York-Azores cable already in operation. The New York-Azores cable is 2,350 nautical miles long and the Emden-Azores cable 1,980 nautical miles, making the total mileage of the new route 4,330.

Appalachian Power Company to Spend $3,500,000.—Approximately $3,500,000 will be spent for new lines and improved electrical facilities in 1927 by the Appalachian Power Company, officials announce. These undertakings include the previously reported high-tension line from Switchback, W. Va., through Saltville, Va., to Kingsport, Tenn., a distance of 80 miles. This line will cost about $1,750,000. At Kingsport this line will connect with the eastern Tennessee division of the Carolina Power Company. It is to be built primarily for an interchange of energy with the Carolina company. Substations will be built at Saltville and Kingsport. Work on the line has started. Another line in course of construction through Switchback to Logan, W. Va., will connect Logan with the western division of the American Gas & Electric Company's lines. A 26,250-kw. generator is being installed at the company's largest power plant at Glen Lyn, Va., and is expected to be ready by May. It will increase the capacity of the plant 50 per cent.

Montana's Water Power. — Charles W. Towne of the Montana Power Company recently made an address on the hydro-electric possibilities of Montana. Mr. Towne put the potential water power of the state at 2,550,000 hp. Montana's principal water-power sites are found along the Missouri River, Clark's Forks and their tributaries. There has been developed 360,000 hp., of which the Montana Power Company owns 313,000 hp. That company also holds 120,000 undeveloped horsepower. Steam power in Butte formerly cost $125 per horsepower a year, but this has been replaced with electric power costing from $35 to $56 per horsepower-year. Montana has 530 miles of electrified railroad.

Competitor of Municipal Plant Gains Point at Kansas City, Kan.—The United States District Court in Kansas City, Kan., has issued a temporary restraining order to prevent that city from interfering with the Kansas City Power & Light Company supplying power to the Railways Ice Company just inside the city limits. The company's attempt to do so had led to conduits and concrete being torn out and a restraining order which prevented the company from establishing connections. This order is now dissolved. If the restraining order is made permanent, it will break the city's monopoly on the distribution of light and power and settle an altercation that reaches back to last May over the right of the Kansas City Power & Light Company to take new business across the river in Kansas City, Kan.

Hydro Project on American River in California Is Blocked.—Immediate construction of an eight-million-dollar power and irrigation project on the American River in east central California (see ELECTRICAL WORLD for Dec. 4, 1926, page 1181) has been blocked by an opinion rendered by Attorney-General U. S. Webb, which holds that sale by the state of a tract of Folsom prison land to the American River Hydro-Electric Company is illegal. The Attorney-General's opinion is based on technicalities concerning disagreement between the body of the bill and the title of the bill which affected the contract between the state and the power company.

Central Hudson-Connecticut Power Interconnection Goes Into Service.—Last month saw the completion of the 66,000-volt, 37-mile transmission line built between Poughkeepsie, N. Y., and Falls Village, Conn., to connect the system of the Central Hudson Gas & Electric Corporation with that of the Connecticut Power Company. The new connection is a double-circuit steel-tower line arranged for future 110-kv. operation with one circuit installed at present. The conductors are No. 4/0 copper for 6 miles out of Poughkeepsie and then change to No. 4/0 aluminum. The Central Hudson corporation serves territory on the west side of the Hudson River and also territory on the east side north and south of Poughkeepsie from Rhinebeck to Garrison. The transmission lines of the corporation join those of the Mohawk-Hudson system at South Bethlehem and join the lines of the New Jersey-Pennsylvania system at the New York-New Jersey state line near Warwick, N. Y. The Connecticut Power Company is one of a group of five utilities in Massachusetts and Connecticut participating in a unified scheme of operation known as the Connecticut Valley Power Exchange. The interconnected transmission system of this group of utilities extends from Turners Falls, Mass., on the north to Norwalk, Conn., on the south.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 1. page 80.]

American Institute of Electrical Engineers—Southwestern District, Kansas City, March 17-18; Middle Eastern District, Bethlehem, Pa., April 21-23; Northeast District, Pittsfield, Mass., May 25-27. F. L. Hutchinson, 36 West 39th St., New York.

National Electrical Manufacturers' Association, Policies Division.—Briarcliff Manor, N. Y., March 17-18. S. N. Clarkson, 30 East 42d St., New York.

Illinois State Electric Association — St. Nicholas Hotel, Springfield, Ill., March 17 and 18. R. V. Prather, 205 Illinois Mine Workers' Building, Springfield, Ill.

Northwest Electric Light and Power Association, Accounting Section—Gasco Building, Portland, Ore., March 21. W. L. Fitzpatrick, Mountain States Power Company, Tacoma, Wash.

Southeastern Division, N.E.L.A.—Peabody Hotel, Memphis, Tenn., April 13-15. C. M. Kilian, 404 Wynn-Claughton Bldg., Atlanta.

Southwestern Division, N.E.L.A.—New Orleans, April 26-29. S. J. Ballinger, San Antonio Public Service Company, San Antonio, Tex.

Southwestern Public Service Association — New Orleans, April 26-29. E. N. Willis, 403 Slaughter Bldg., Dallas, Tex.

Nebraska Section, N.E.L.A.—Grand Island, Neb., April 27-28. H. M. Davis, 1519 O St., Lincoln.

American Electrochemical Society — Benjamin Franklin Hotel, Philadelphia, April 28-30. Colin G. Fink, Columbia University, New York.

Electrical Supply Jobbers' Association —Greenbrier Hotel, White Sulphur Springs, W. Va., May 2. Franklin Overbagh, 411 South Clinton Street, Chicago.

Missouri Association of Public Utilities —Cape Girardeau, May 5-7. F. D. Beardslee, 315 North 12th St., St. Louis.

Middle West Division, N.E.L.A. — Topeka, Kan., May 18-20. H. M. Davis, 1519 O St., Lincoln, Neb.

Canadian Electrical Association—Clifton Hotel, Niagara Falls, Ont., May 25-27. J. B. Woodyatt, Southern Canada Power Company, Montreal.

National Electric Light Association—Atlantic City, N. J., June 6-10. Paul S. Clapp, 29 West 39th St., New York.

Men of the Industry

M. L. Sindeband Now Vice-President American Brown Boveri

Maurice L. Sindeband has been elected a vice-president of the American Brown Boveri Company and assumed his duties on March 1. Since 1915 Mr. Sindeband has been in the engineering department of the American Gas & Electric Company, and he was recently elected a vice-president of this company in charge of the electrical engineering department.

After receiving his education at Columbia University, Mr. Sindeband started his engineering career in 1907 with the New York Central Railroad. His next occupation was station-design work with the Brooklyn Edison Company, and in 1915 he entered the

M. L. SINDEBAND

engineering department of the American Gas & Electric Company. His rise here was rapid, and he was made electrical engineer in 1918. In this position he carried on extensive development work in transmission, in carrier-current communication, in oil circuit breakers and in outdoor substations. He has been a leader in transmission-line and substation standardization work and has been connected intimately with tests and researches on lightning protection and oil breakers. The rapid growth of the American Gas & Electric system called for working out large-scale interconnection plans and the building up of a consolidated operating organization. In this executive engineering work Mr. Sindeband was so successful that he was made a vice-president.

Several patents attest his ability as an inventor, and he has been very active as a writer of articles for the technical press and has presented several papers before the American Institute of Electrical Engineers. He is a member of the A.I.E.E. and the New York Electrical Society and has been an active and competent committee worker in both the Institute and the National Electric Light Association.

Benjamin Whiteley, a vice-president of the United Electric Light & Power Company, New York, and treasurer of the Consolidated Gas Company of New York, the Astoria Light, Heat & Power Company and the Tarrytown Terminal Corporation, has been made a vice-president of the Consolidated Gas Company and will continue to serve in all five capacities. A native of Maryland, Mr. Whiteley entered the employ of the Consolidated organization in 1900 and has occupied the office of treasurer since 1920.

Stone & Webster Appointments

George H. Clifford, formerly district manager of the Southwestern companies under Stone & Webster executive management, has been appointed division manager in charge of these companies, the Virginia Electric & Power Company and subsidiaries and the northern district properties of the Eastern Texas Electric Company. Mr. Clifford's headquarters will be in the Boston office beginning April 1. Walter H. Burke, formerly manager of the Northern Texas Traction Company and Tarrant County Traction Company, has been appointed district manager of the companies in the Southwest, comprising the plants in Texas, Louisiana, New Mexico and Mexico. After March 15 Mr. Burke will be stationed at Houston, Tex. Philip M. Wentworth, formerly manager of the Cape Breton Electric Company, Ltd., has been appointed manager of the Florida Motor Lines, Inc., and its affiliated companies and elected vice-president of Florida Motor Lines, Inc. Leon E. Seekins, formerly assistant to the manager of the Lowell (Mass.) Electric Light Corporation, has been appointed manager of the Cape Breton Electric Company, Ltd., Sydney, Nova Scotia.

J. Frank McLaughlin, vice-president of the Virginia Electric & Power Company, with headquarters in Norfolk, has been elected first vice-president to succeed William E. Wood, now president of the company.

Samuel Insull, president of the Commonwealth Edison Company, Chicago, sailed March 5 aboard the White Star liner *Olympic* for a short sojourn in Europe.

General James G. Harbord, president of the Radio Corporation of America, returned from Europe March 9 aboard the Cunard liner *Berengaria* after spending a month abroad.

W. Cullen Morris, who has been identified with the Consolidated Gas Company of New York since 1905, when he became assistant engineer of manufacture, has been promoted to a vice-presidency in the company. Two years after joining the company's staff he was appointed engineer of construction, subsequently becoming assistant chief engineer and later chief engineer. In addition to being vice-president and chief engineer of the Consolidated organization, he is at the present time president and chief engineer of the Astoria Light, Heat & Power Company and treasurer of the National Coke & Coal Company. Mr. Morris is a member of the American Society of Mechanical Engineers, the Illuminating Engineering Society, the American Society of Civil Engineers and other technical associations.

E. Van Arsdel Chief Executive of Interstate Public Service

E. Van Arsdel, who has been selected for the presidency of the Interstate Public Service Company, Indianapolis, as already announced in the ELECTRICAL WORLD, is a native of Kentucky, but a resident of Indianapolis since the spring of 1917. At that time he was appointed operating manager of the Interstate, which office he occupied for one year. The following year he was promoted to be vice-president. Mr. Van Arsdel was vice-president of the Kentucky Utilities Company at the time of his appointment as a member of the Interstate organization. He was associated in the operation of the Kentucky Utilities Company properties at Louisville for five years with Harry Reid, whom he is now succeeding as president of the Interstate Public Service Company.

E. VAN ARSDEL

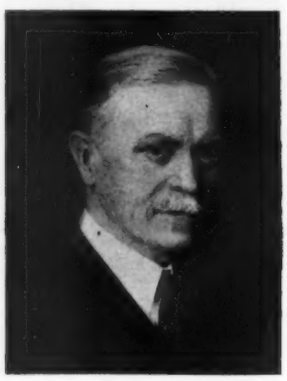
George E. Roberts, vice-president of the National City Bank, has been elected a member-at-large of the Engineering Foundation, according to an announcement made by Chairman Lewis B. Stillwell. Mr. Roberts succeeds Elmer A. Sperry and will serve three years.

Joseph G. Worker has been appointed general sales manager of the American Engineering Company, Philadelphia, the appointment being the beginning of extensive plans for marketing the company's many and varied products. At the same time he was elected a member of the board of directors. Mr. Worker assumes his new duties with more than 20 years' experience in engineering and sales work and with an intimate knowledge of the products and policies of the company, acquired during the past five years as assistant to the president. A graduate of the University of Illinois with the degree of B.S. in mechanical engineering, he is a member of the American Society of Mechanical Engineers, a former president of the Stoker Manufacturers' Association and is widely known as a writer of articles on combustion engineering and co-author of a work on

mechanical stokers. For fifteen years Mr. Worker had been associated with the Westinghouse companies and for the last five years of that period he was manager of the stoker section of the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

J. L. McQuarrie Elected to New Executive Position

James L. McQuarrie, one of the best-known engineers in the field of electrical communications, has been elected vice-president and chief engineer of the International Telephone & Telegraph Corporation. For the past 45 years Mr. McQuarrie has been continuously engaged in engineering work relating to the electrical communication services. This entire period was spent with the Bell Telephone System up to the date of purchase of the International Western Electric Company by the International Telephone & Telegraph Corporation on Oct. 1, 1925. Much of his time has been occupied with research and development work, and he is credited with



J. L. McQUARRIE

a total of one hundred inventions, in addition to development work on automatic telephone systems and in the general field of electrical communications.

Mr. McQuarrie is thus well qualified for the position to which he has just been elected. He has, besides, traveled extensively in Europe and in the Orient and has a very wide acquaintance among telephone men throughout the world. In the past year he was elected a fellow of the American Institute of Electrical Engineers. During his first visit to Tokyo, in 1920, Mr. McQuarrie was decorated by the Emperor of Japan with the Order of the Rising Sun.

F. M. Plake has been named chief valuation engineer for the Missouri Public Service Commission to succeed James L. Harrop, resigned. Mr. Plake has been with the commission as an assistant valuation engineer for four years. Prior to that he was in the valuation department of the Interstate Commerce Commission.

Arthur Simonson, sales manager of the steel foundry department of the Falk Corporation, Milwaukee, since 1916, has been elected a vice-president of the corporation. A Briton by birth, Mr. Simonson removed to the United States in 1900 as representative of Alexander Tropenas, inventor of the side-blow converter, installing the process in various plants. He has been identified with the Falk Corporation in various capacities for the past seventeen years.

Claxton E. Allen, manager of the Westinghouse Electric & Manufacturing Company's St. Louis offices, has been selected by the nominating committee for president of the St. Louis Electrical Board of Trade to succeed Frank J. Boehm, vice-president of the Union Electric Light & Power Company.

Obituary

George J. Baldwin

George J. Baldwin, public utility leader and retired capitalist, died March 4 at Johns Hopkins Hospital, Baltimore, in his seventy-first year. A native of Savannah, Ga., Mr. Baldwin had been affiliated with Stone & Webster, Inc., since 1898 and at the time of his death was chairman of the board of directors of the Savannah Electric & Power Company. During his period of service with the Stone & Webster interests he organized several of the leading public utility electric companies in the South and supervised their operations as president. Included were the Savannah Electric Company, the Jacksonville Traction Company, the Key West Electric Company, the Pensacola Electric Company and the Tampa Electric Company.

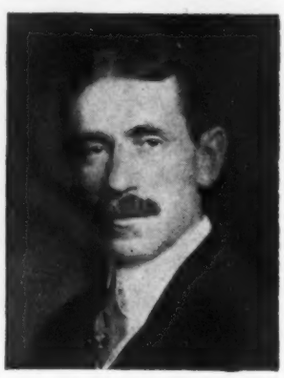
Early in his career Mr. Baldwin was connected with the Woodstock Iron Company, Anniston, Ala.; the Bradley Gold Mine Company, Baldwin & Company, and the Baldwin Fertilizer Company. During the war he was vice-president of the American International Corporation, formed to extend the foreign financial and commercial relations of the United States.

Mr. Baldwin was born in Savannah Aug. 18, 1856, and with the exception of eight years which he spent in New York lived most of his life in his native city.

Clarence E. Reid, professor of electrical engineering and head of the electrical engineering department of the Kansas State Agricultural College since 1914, died Feb. 28, following a stroke of apoplexy. Although Professor Reid was, perhaps, best known as an educator, the electrical industry recognized him as an authority on matters involving electrical phenomena. His work in electrical research was nationally known through his investigations of armature core losses and the accuracy of wattmeters. Professor Reid was a native of Ohio and a graduate of Purdue University. During his academic career he was affiliated with Purdue University, George Washington University, the Case School of Applied Science and the Mississippi Agricultural and Mechanical College. In 1914 he joined the faculty of the Kansas State Agricultural College as head of the department of electrical engineering and continued in that capacity until his death. Professor Reid was a member of the American Institute of Electrical Engineers and the Society for the Promotion of Engineering Education.

Dudley Farrand

Dudley Farrand, a vice-president of the Public Service Corporation of New Jersey, Newark, and past-president of the National Electric Light Association, died March 8 at Fairhaven, N. J., in his 59th year. Mr. Farrand had been affiliated with the electric light and power industry in Newark since 1887, when he became assistant secretary of the Newark Electric Light & Power Company, subsequently being in charge of design and construction. After an association with the People's Light & Power Company, during which he was assistant general manager and general manager, he became general manager of the United Electric Company of New Jersey, and four years later he obtained the same position with the electric department of the Public Service Corporation of New Jersey.



DUDLEY FARRAND

On the formation of the Public Service Electric Company in 1910 to take over all the electric properties of the Public Service Corporation Mr. Farrand was appointed its general manager. Five years later he was made its vice-president and general manager, assuming in addition the duties of assistant to the president in 1917. Mr. Farrand was president of the National Electric Light Association in 1907 and the following year was appointed by President Roosevelt as technical adviser to the National Conservation Commission representing the electrical interests. He was a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers and the Engineers' Club of New York.

Joe C. Thompson, secretary and assistant treasurer of the Texas Power & Light Company of Dallas, died at a Dallas hospital Feb. 28. Mr. Thompson was also tax commissioner of the Texas Power & Light Company, Dallas Power & Light Company, Dallas Railway & Terminal Company and the Texas Electric Railway, Inc. He had been connected with these companies since 1913 and had lived in Dallas for 25 years. Mr. Thompson was 52 years of age.

Recent Court Decisions

Franchise Provision Fixing Permanent Price Not Enforceable in Oklahoma.—The Supreme Court of Oklahoma, in City of Tulsa vs. Oklahoma Natural Gas Company, held that a city ordinance granting a franchise to the company which contained a provision that the price of gas should at no time exceed 25 cents per 1,000 cu.ft. could not be enforced under the state laws governing utilities. (252 Pac. 431.)*

Jury Must Decide Whether Prima Facie Evidence of Negligence Is Met by Defendant.—In Smith vs. Annapolis & Chesapeake Bay Power Company, a damage suit, testimony was to the effect that the plaintiff's decedent was killed by contact with a charged fallen wire while walking in a public street, that the wire fell 30 minutes before the deceased came in contact with it, that the trouble station was called by telephone three times before the accident and warned of the dangerous condition of the wire, that this station was within a walking distance of four minutes from the place of the accident, that the only man who was on duty at night to attend to emergency calls was out on other trouble, and that the duty of the operator in charge was not to leave the station. The Court of Appeals of Maryland held that the lower court was correct in permitting the jury to pass on the defendant's negligence, the question of whether the company had successfully met the prima facie evidence against it being one for jury determination.

Protection Against Competition Inheres in Government Regulation.—That the right to protection against competition in the sale of natural gas was properly claimed by the Kansas Gas & Electric Company in a suit against the Kansas Public Service Commission was asserted by the Kansas Supreme Court, which said, as summarized in "Public Utilities Reports": "In years agone, when competition was the rule, 'with the race to the swift and the devil take the hindermost,' a public service corporation established its plant, invested its capital, and investors put their savings in its stocks and bonds with their eyes open, knowing the possibility of their investments being rendered unprofitable by the intrusion of competitors in the same field. But they also had the allurement of possible large profits to stimulate their enterprise and to justify their speculative investments. Nowadays public service companies and their stock and bond holders proceed on a different theory which has for its basis their confidence in a fair and just administration of the public utilities act. In determining whether such certificate of convenience should be granted the public convenience ought to be the commission's primary concern, the interest of public utility companies already serving the territory secondary, and the desires and solicitations of the applicant a relatively minor consideration."

Seattle Must Reimburse Puget Sound Company for Taxes.—The decision of the lower courts that the city of Seattle must pay the Puget Sound Power & Light Company $545,370 to reimburse the company for taxes paid on the street-railway lines sold by the company to the city in 1919, together with interest, will stand, the United States Supreme Court having refused to grant a writ of certiorari to review the case. Each side had appealed, the company from a decision by the Circuit Court of Appeals which modified the decree of the District Court so as to provide payment from a special fund, and the city from the entire order. In a previous decision the Supreme Court held in a related case that the contract by which the company sold the street railway to the city bound the city to pay the taxes for the year in which the sale was made.

Government Sustained in War-Time Use of Apparatus.—By a decision of the United States Supreme Court the De Forest Radio Telephone & Telegraph Company has lost a suit against the United States for recovery of damages for the alleged unlawful use by the government of certain patented vacuum tubes or audions used in radio communications. The De Forest company had granted licenses to the American Telephone & Telegraph Company for the use of its patents, and the latter company granted permission to the government to have tubes made for its use during the war. The De Forest company claimed that the American company had granted this permission under duress. The court said that the evidence failed to disclose any duress and that under patent law the acts of the licensee were binding upon the owner of the license.

Has the Public an Interest in Depreciation Reserve?—The West Virginia Supreme Court of Appeals, in City of Elkins vs. Public Service Commission, refused, in fixing the rate base of natural-gas utilities, to deduct the depreciation reserve from the value of the physical property and held that the public does not have any interest in said reserve. To sustain its action the court quoted the United States Supreme Court, which, it said, has recently held in several cases that the public does not have any interest in accrued depreciation reserve and that in rate making it cannot properly be charged to the utility, as follows: "The revenue paid by the customers for service belongs to the company. The amount, if any, remaining after paying taxes and operating expenses, including the expense of depreciation, is the company's compensation for the use of its property. If there is no return or if the amount is less than a reasonable return, the company must bear the loss. Past losses cannot be used to enhance the value of the property or to support a claim that rates for the future are confiscatory. And the law does not require the company to give up for the benefit of future subscribers any part of its accumulations from past operations. Profits of the past cannot be used to sustain confiscatory rates for the future." (135 S.E. 397.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Protection of Investors as Based on Estimates of Company Applying for Approval of Security Issues.—Denying authority to the Central Steam Heat & Power Company to issue securities for the erection of steam-heating plants at Port Washington and Plymouth, the Wisconsin Railroad Commission said that approval should not be granted where the company fails to substantiate its estimate of distribution efficiencies, of the number of customers and of probable sale, and where acceptance of the company's engineering estimates as a basis for the issuance of a certificate would result in withdrawing from investors the protection to which they are entitled under the law.

Proposed Segregation of Property for Rate-Making Purposes Condemned.—In adjudicating complaints against the gas and electric rates charged by the Plattsburg (N. Y.) Gas & Electric Company, the New York Public Service Commission said: "The original complaint was against the rates charged throughout the territory of the company. On Oct. 3, 1925, when the city of Plattsburg first appeared in the matter, a motion was made to have the property of the company segregated as between the city of Plattsburg and outside territories. The company contended that this was impracticable and would work no benefit to any of the parties concerned, that the territory was practically one unit and all communities served from the same sources ought to be treated as one district for rate-making purposes. The city presented exhibits showing detailed segregations of the property, but the method by which this segregation was arrived at seemed to be most improper and unscientific. It is felt that even if segregations were desirable, it would be impossible to follow the methods of segregation proposed by the city. Undoubtedly administration and operation by this company would be practically as expensive for Plattsburg alone as for the whole system. Geographical considerations must also be taken into account. . . . The whole development of the company outside the city is in a very limited area. . . . If the segregation between the city and country consumers as asked for by the city were followed, we would arrive at a condition which would be to the disadvantage of consumers. It is felt that a segregation such as proposed is impracticable and that the property should be treated as a unit, but in view of the peculiar conditions in this company arising from the fact of the large proportion of kilowatt-hours being sold to two special customers, a segregation of the results of these contracts should be made."

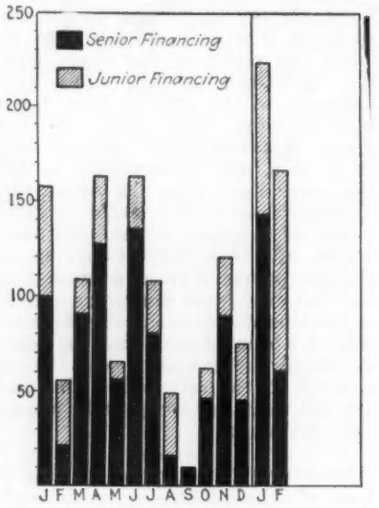
Financial and Statistical

Utility Stocks Recede Slightly
Bond Prices Hold Firm
Financing Makes New Records

BEAR attacks upon many of the market leaders had the effect of depressing averages slightly in a quite erratic market. The power and light stocks held as well as any individual group, so that the net change of the week has been almost negligible. A list of representative common stocks shows as many gains as losses for the week and the average continues unchanged. Preferred issues continue to move only fractionally and without a definite trend. Common and preferred issues which registered gains during the week include American Water Works, Detroit Edison and Pacific Gas & Electric among the former and Central Illinois Public Service preferred.

Bond prices have shown a further marginal rise during the week. The average of ten representative issues stands at 102.7, against 102.5 a week ago and 99.1 a year ago. Commonwealth Edison and Cleveland Electric Illuminating issues showed advances.

Power and light financing for the first two months of the current year exceeded one-third of the entire 1926 total. The bulk of this year's total so far is in obligations—either mortgage bonds or debentures—the market being highly favorable for such financing. Senior and junior financing divide the total almost equally. Taking the twelve months ending with March 1, however, senior financing amounts to almost 70 per cent of the total. The recent increase in debenture financing has reduced this large proportion of senior financing.

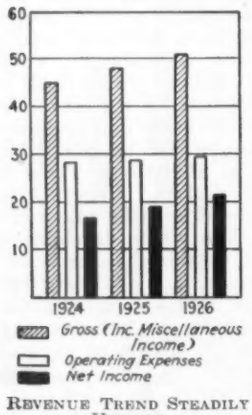


MONTHLY FINANCING MUCH HIGHER THAN 1926 AVERAGE

Pacific Gas & Electric Shows Progress

Income Account for 1926, Recently Issued, Reveals Substantial Growth—Net Income Up 12 per Cent—Sales of Electrical Energy Advanced 12 per Cent

A RISE in gross revenue of 6.35 per cent was reported by the Pacific Gas & Electric Company in its preliminary income account for the year 1926, recently issued. Gross revenue, including miscellaneous income, amounted to $51,125,990 as compared with $48,066,897 during the previous year. Operating expenses, totaling $29,654,474, left a net of $21,471,516, an increase of $2,303,330 over 1925, or 12 per cent.



REVENUE TREND STEADILY UPWARD

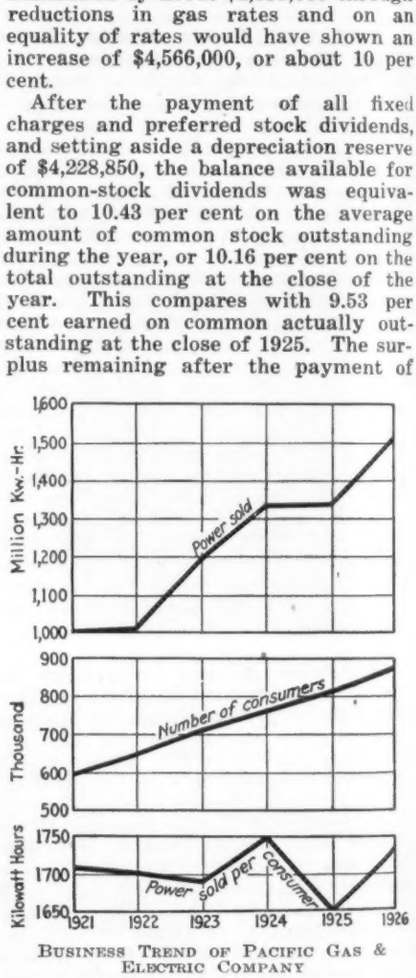
New capital invested during the year in plant additions will run somewhat less than $20,000,000, and increased earnings are, in a large measure, merely a reflection of the rental value of this additional capital employed in service to customers. Of the year's operating gross 61 per cent was derived from electric sales, 34 per cent from gas sales, and the remaining 5 per cent from other utility services. Operating expenses included $3,511,000 for maintenance and also reserves for uncollectible accounts and casualties and for federal taxes payable in 1927. Total upkeep provision obtained by combining maintenance expenditures and depreciation reserve amounted to $7,740,000, or 15 per cent of gross operating revenues, and exceeded last year's charges to these accounts by $400,000.

Sales of electrical energy were 1,511,000,000 kw.-hr., an increase of 162,000,000 kw.-hr., or 12 per cent. Gas sales were 17,480,000,000 cu.ft., an increase of 1,279,000,000 cu.ft., or 8 per cent. The number of active meters in service at the close of 1926 was 874,724, a net increase of 61,026 within the year. These physical data reflect the increase in the company's business more accurately than a comparison of gross operating revenues, as the latter were diminished by about $1,335,000 through reductions in gas rates and on an equality of rates would have shown an increase of $4,566,000, or about 10 per cent.

SUMMARY OF INCOME ACCOUNT, 1926

	1926	Increase
Gross revenue, including miscellaneous income	$51,125,990	$3,059,093
Operating expenses	29,654,474	755,763
Net	$21,471,516	$2,303,330
Bond interest and discount	8,383,425	874,588
Depreciation reserve	4,228,850	420,859
Surplus	$8,859,241	$1,007,883
Dividends on preferred stock (6 per cent)	$3,488,880	$223,446
Dividends on common stock (8 per cent)	4,119,970	495,633
Balance	$1,250,390	$288,804

After the payment of all fixed charges and preferred stock dividends, and setting aside a depreciation reserve of $4,228,850, the balance available for common-stock dividends was equivalent to 10.43 per cent on the average amount of common stock outstanding during the year, or 10.16 per cent on the total outstanding at the close of the year. This compares with 9.53 per cent earned on common actually outstanding at the close of 1925. The surplus remaining after the payment of common stock dividends was $1,250,390, an increase of $288,804 compared with 1925.



BUSINESS TREND OF PACIFIC GAS & ELECTRIC COMPANY

The company's construction program this year calls for the expenditure of about $20,000,000. No new financing, except, possibly, in the latter part of the year, will be necessary as present cash exceeds $7,000,000, and by June 1 approximately $5,500,000 will become due from the sale of common stock to common-stock holders, to whom the right has been extended to purchase this additional stock at par in the ratio of 10 per cent of existing holdings. Substantial amounts for reinvestment will also be available from reserves and surplus above dividend requirements, and to the extent of $3,000,000 from certain minor properties.

Production Continues Upward

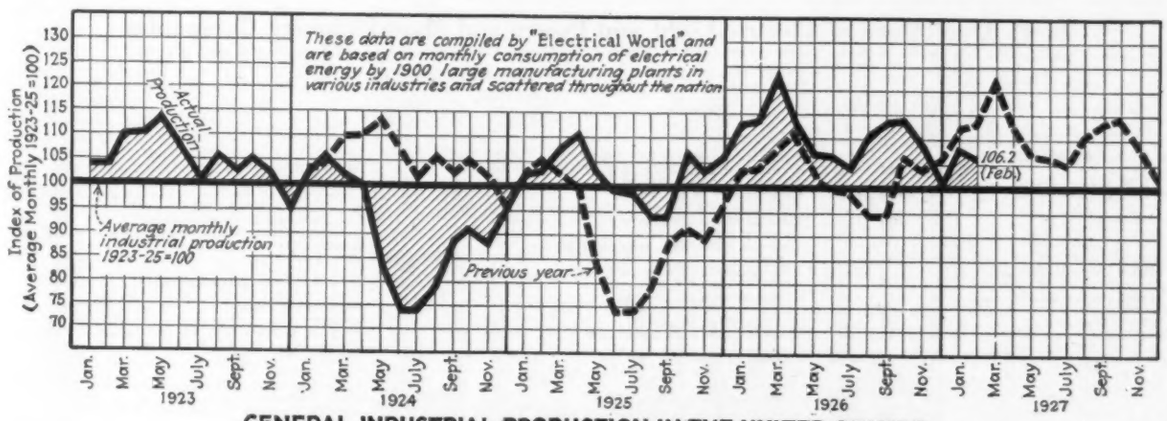
Actual February Industrial Production Slightly Below That of January, but Rate of Productive Activity Was 12.7 per Cent Over January

IN SPITE of the fact that February contained three fewer working days than January, the actual productive operations of American manufacturing plants taken as a whole during February were practically the same as during January. Such an increase, however, is largely normal in character at this season of the year, as is indicated by the fact that the same production situation was recorded in February of last year. The significant fact, however, is that both January and February industrial production was about 6 per cent under that recorded in January and February of last year. The year, therefore, seems to be unfolding with industrial operations increasing at a normal rate for this season of the year, but with general production on a slightly lower plane than was witnessed during the first quarter of 1926. March productive operations last year reached record proportions, but it is doubtful whether the present March will be able to record increased production over February of the same magnitude as was recorded during March, 1926. It seems probable that industrial production during the first quarter of 1927 will be between 6 and 7 per cent under that of the first quarter of 1926.

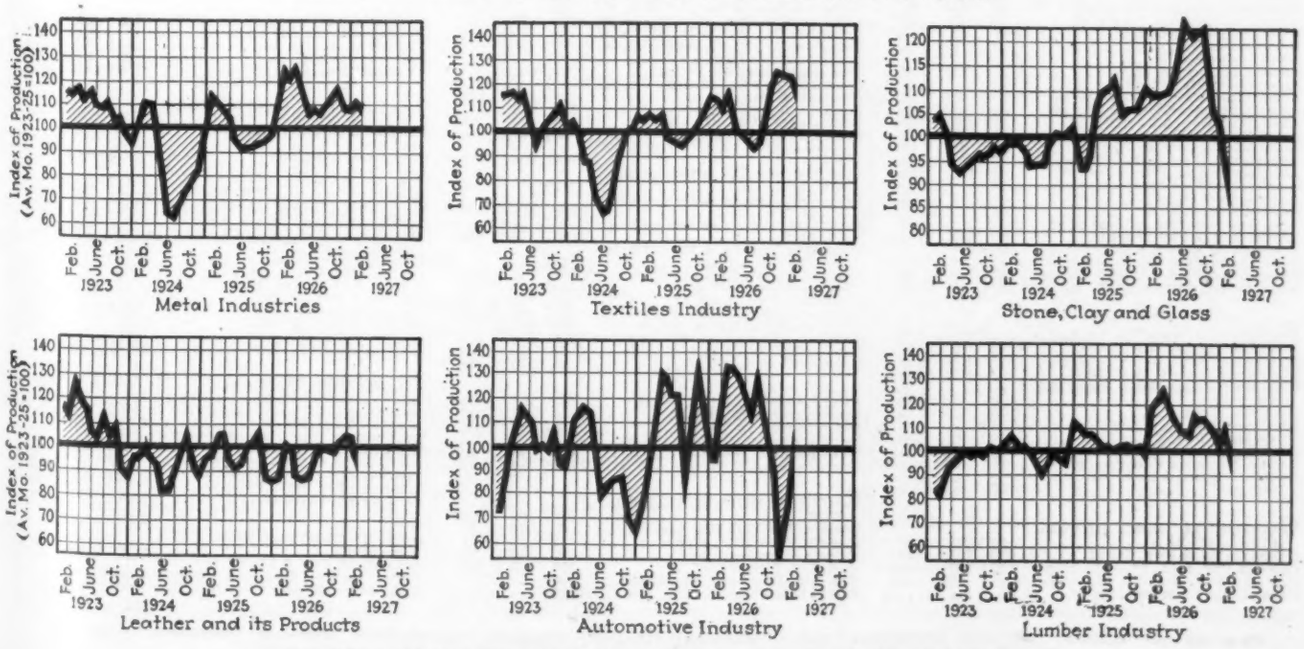
While the actual production during February, as indicated in the accompanying barometer, was about 0.5 per cent under that of January, yet when corrections for the number of working days are made the fact is disclosed that February recorded a materially increased rate of industrial activity. The rate of general industrial activity during February was 12.7 per cent over that of January, and the five outstanding primary industries recorded the following increases in activity over January: Metal industries, 10.8 per cent; leather and leather products, 4.2 per cent; textiles industry, 7.4 per cent; automobile industry, 61.8 per cent; stone, clay and glass industry, 1.0 per cent. The lumber industry appears to have slightly decreased its rate of activity during February. Such is the status of American industrial production operations as indicated by reports received by the ELECTRICAL WORLD on the consumption of electrical energy by the manufacturing plants of the nation —plants consuming more than 9,000,000,000 kw.-hr. per annum.

The outstanding factor in industrial operations during the first two months of the year has been the materially increased production of automobiles. Operations in the automobile manufacturing plants reached an unusually low point in December, the lowest monthly production recorded since the opening of 1922. The January automobile production, however, was 44 per cent over December, and February production was 43 per cent above January, so that the production in automobile plants during February was approximately double that reported for December. The February automobile production, none the less, was still about 5 per cent under that of February last year.

Actual production during February in the metal industries taken as a whole appears to have been about 2.4 per cent under that of January, although the rate of activity in these plants during February was about 11 per cent over January.


These data are compiled by "Electrical World" and are based on monthly consumption of electrical energy by 1900 large manufacturing plants in various industries and scattered throughout the nation
Index of Production (Average Monthly 1923-25=100)
Actual production
Average monthly industrial production 1923-25=100
Previous year
106.2 (Feb.)
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926 1927

GENERAL INDUSTRIAL PRODUCTION IN THE UNITED STATES


Index of Production (Av. Mo. 1923-25=100)
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1923 1924 1925 1926 1927
Metal Industries
Textiles Industry
Stone, Clay and Glass
Leather and its Products
Automotive Industry
Lumber Industry

ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

Federal Trade Commission Attacks Financial Methods

Pyramiding of utility companies and drawing banking profits from subsidiaries came in for severe criticism by the Federal Trade Commission in its report, published last week. Several companies were named as offenders.

The Northeastern Power Corporation drew censure on both counts. "Important features of its organization," says the report, "are the taking of bankers' and promoters' profits in cash furnished largely by voteless preferred-stock buyers." With regard to the benefits of consolidation, the report admits the unquestioned advantages of interconnection, but infers that interchange of current could be carried on without complicated recapitalization procedure. It is pointed out that the New England Power Company and the Adirondack Power & Light Corporation were already interchanging current before this process of multiplying securities commenced.

The National Public Service Company is also cited in connection with pyramiding. The report says: "In the endeavor of the present controlling interests and their predecessors to obtain as large a control as possible with the funds at their command and to make as large a profit as possible in the turnover of the companies, controlling company has been piled upon controlling company and controlling company bonds and stocks have been superposed upon stock equities to such an extent that the chief company's securities represent little or no investment in the business of the operating companies. The chief company's primary function is not that of an investment company combining diversified stock equities of operating companies so as to afford stability of earning power behind the securities offered. It is rather the apex of a tall pyramid of control so designed as to afford a maximum of control with the minimum of investment."

New Capital Issues

First mortgage collateral 4½ per cent gold bonds, series D, of the Commonwealth Edison Company were offered the investing public during the week ended March 10 to the amount of $15,000,000. The bonds, dated Jan. 1, 1927, and maturing July 1, 1957, were priced at 96 and interest, yielding 4.75 per cent.

With the purpose of raising funds for additions, extension and improvements, the Long Island Lighting Company issued 6 per cent cumulative preferred stock to the amount of $2,000,000, the price being 100 and accrued dividend.

The Central Public Service Corporation made an offering of series A 6 per cent collateral trust gold bonds amounting to $750,000 at 97 and accrued interest to yield over 6.30 per cent.

The Southern Ohio Public Service Company issued first mortgage 5½ per cent gold bonds, series C, to the amount of $2,100,000 at 96½ and accrued interest.

First mortgage twenty-year 5 per cent gold bonds of the United Power & Light Corporation were offered to the amount of $1,000,000, the price being 96 and interest, yielding over 5.30 per cent.

Following the announcement of the merger of six public utilities in Georgia into the Georgia Power Company comes the flotation of a forty-five-million-dollar bond issue to retire existing high-priced issues. This issue of first and refunding mortgage gold bonds has a duration of 40 years and bears interest at 5 per cent.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday March 8	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	91¼	83	91¼
Adirondack Pwr. & Lt.—7% pf.	107½	107	109¼
Adirondack Pwr. & Lt.—8% pf.	112	112	114
Ala. Pwr., 7% pf.	110	....	....
Allis-Chalmers Mfg., 7% pf.	k110	109	111¼
Allis-Chalmers Mfg., 6% com.	95½	88	97¼
Aluminum Co. of Amer., com.	70¼	....	....
Aluminum Co. of Amer., 6% pf.	k103	101¼	103
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	90½	86½	90½
Amer. & Foreign Pwr., com.—no par.	20½	18½	23
Amer. Bosch Magneto, com.—no par	15½	13	18½
Amer. Brown Boveri Elec†	33½	32	39½
Amer. Brown Boveri Elec., pf. $7	k 94	95½	98
Amer. Gas & Elec., 6% pf.—no par	97½	95½	98½
Amer. Gas & Elec., com.†—no par.	71½	68½	100½
Amer. Lt. & Trac., 6% pf.	112	112	120
Amer. Lt. & Trac., com.†	231	224½	235
Amer. Pwr. & Lt., 6% pf.	99½	97½	100½
Amer. Pwr. & Lt., com.†—no par.	56½	54	61¼
Amer. Pub. Serv., 7% pf.	k 98	95	99½
Amer. Pub. Serv., com.†	50	....	....
Amer. Pub. Utilities, 7% pr. pf.	89	88	93
Amer. Pub. Utilities, 7% ptc. pf.	70	73	82
Amer. Pub. Utilities, com.	m66	65	70
Amer. States Sec., A.	3	3½	4½
Amer. States Sec., B.	3	3	4
Amer. Superpwr., $6 pf.—25	k 27½	26½	28½
Amer. Superpwr., 7% pf., ex. div.	93½	....	....
Amer. Superpwr., Class A†—no par.	29½	27½	29½
Amer. Superpwr., Class B†—no par.	29½	28½	30
Amer. Wtr. Wks. & Elec., 7% pf.	105½	105	110½
Amer. W. W. & E., com. $1.20—20.	73½	62½	78½
Anaconda Copper Cap. $3.	47	45	49½
Appalachian Electric Pwr., 7% pf.	100	100	102
Appalachian Elec. Pwr., 2d pf., 7%	98	100	102
Appalachian Elec. Pwr., com.	m78	....	....
Arizona Pwr., 7% pf.	79	77	84½
Arizona Pwr., com.	23	....	....
Arkansas Cent. Pwr., pf.—$7 no par.	k102	101	103
Arkansas Lt. & Pwr., 7% pf.	102	101	104
Arkansas Lt. & Pwr., com.	100	....	....
Assoc. Gas & Elec., $3.50—50.	51	....	....
Assoc. Gas & Elec., pf.—$6—no par.	87½	85	90
Assoc. G. & E., Class A, $2.50—no par	40½	35	41½
BABCOCK & WILCOX, 7% com.	117½	115	119
Binghamton L., H. & P., $6 pf.	91	93	95
Birmingham Elec., pf.—$7—no par.	107	105	109
Blackstone Valley G. & E., $6 pf.	102	103	105
Blackstone Valley Gas & Elec., 10% com.—50.	100½	98½	108
Blaw-Knox, com.†	f 70½	70	73
Brazilian Trac., Lt. & pwr., com.†	f124½	....	....
Broad River Pwr., 7% pf.	98	97	100
Brooklyn Edison, 8% com.	150½	148½	154½
Buffalo, Niagara & East. Pwr., pf.—25	25½	....	....
Buffalo, Niagara & East. Pwr. com.†—no par	27	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	96	96	98
California Ry. & Pwr., 7% pf.	130	125	150
Carolina Pwr. & Lt., pf.—$7—no par	f107½	107	108½
Central & S.W. Util., 7% pf.—no par	a 95½	93½	96½
Central Ariz. Lt. & Pwr., 7% pf.	95	....	....
Central Ark. Ry. & Lt., 7% pf.	101	100	102
Central Ill. Pub. Serv., 6% pf.	k 88	88	91
Central Ind. Pwr., 7% pf.	88	86	90
Central Pwr. & Lt., 7% pf.	101	100½	103
Central States Elec., 7% pf.	93	93	96
Central States Elec., com.†	m200	....	....
Century Elec., 6% com.	b115	115	115
Chicago Fuse Mfg., com.—$2.50 no par.	a 32	30	34½
Cincinnati Gas & Elec., 5% com.	ρ 94½	93½	95½
Cities Service, 6% pf.	k 88½	87	92½
Cities Service, pf. B—10.	k 7½	7½	8½
Cities Service, pf. BB—100.	k 82	81½	85
Cities Service, com.—20.	k 49½	40½	58½
Cities Service, Bks. Shrs.—10.	k 29½	25	29½
Clarion River Pwr., 8% pf.	95	....	....
Cleveland Elec. Illg., 6% pf.	108	108	109½
Cleveland Elec. Illg., 10% com.	300	302	310
Colorado Pwr., 7% pf.	k 95	95	97½
Columbia Gas & Elec., 6% pf.	101½	99½	101½
Columbia G. & E. com. $5—no par.	85½	82½	91½
Columbia Ry., Gas & Elec., 6% pf.	94	....	....
Columbus Elec. & Pwr., 2d. pf.	106	....	....
Columbus Elec. & Pwr., 9% com.	67½	....	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	97	98½	99½
Columbus Ry., Pwr. & Lt., 6½% pf. B	98	96	99
Columbus Ry., P. & L., com.—no par	70	75	79
Commonwealth Edison, 8% com.	142½	....	....
Commonwealth Pwr., 6% pf.	93½	91½	93½
Commonw'th Pwr., $2, com.—no par	46½	42¼	47½
Conn. Lt. & Pwr., 8% pf.	119	119	123
Conn. Lt. & Pwr., 7% pf.	112	112	113½
Cons. Gas of N. Y., pf.†—50.	55½	55½	62½
Cons. Gas of N. Y., com $5—no par.	98½	97½	109½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	k105	105	107
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	e112½	....	....
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	k111	111	115
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	k126	126	128
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par.	e 51½	....	....
Consolidated Pwr. & Lt., 7% pf.	106	100	103
Consumers Pwr., 6% pf.	102½	100	102
Consumers Pwr., 6.6% pf.	105	103	105½
Continental Gas & Elec., 7% ptc. pf.	105	103	106½
Continental Gas & Elec., 7% pr. pf.	102	100	103
Conti. G. & E. com. $4.40—no par.	220	210	225
Crocker Wheeler, com.†	k 36	30	38
Crocker Wheeler, 7% pf.	82	78	88
DALLAS PWR. & LT., 7% pf.	107	107	109½
Dayton Pwr. & Lt., 6% pf.	101	101	102½
Detroit Edison, 8% com.	138½	133½	139
Dubilier Condenser, com.—no par.	4½	3½	4½
Dubuque Elec., 6% pf.	104	93	105
Duquesne Lt., 7% pf.	k114½	114½	116½
EASTERN NEW YORK UTIL., $7 pf.	102½	102	104½
Eastern New York Util. com.	65	70	75
Eastern States Pwr., $7, com.	12	11	13
Eastern States Pwr., pf.	93	93	95
East. Tex. Elec., 7% pf.	106	106	108
East. Tex. Elec., com. $5—no par.	90	....	....
Edison Elec. of Boston, 12% com.	d225	....	....
El Paso Elec., com. $5—no par.	70	....	....
El Paso Elec., 7% pf.	106	105	106½
Elec. Bond & Share, 6% pf.	f106	105½	109
Elec. Bd. & Sh. Sec., com. $1—no par	f 69	67½	72½
Electric Household Util.†	a 12½	....	....
Elec. Investors, 6% pf.—no par.	93	92	94
Elec. Investors, com.†—no par.	33½	32½	37
Elec. Investors, 10% pd. receipts.	15	....	....
Elec. Pwr. & Lt., ctfs. pf.	k 99	96	99½
Elec. Pwr. & Lt., ctfs., 40% pd.	105½	103½	106½
Elec. Pwr. & Lt., ctfs. full pd.	k106	....	....
Elec. Pwr. & Lt., ctfs., com.—no par.	17½	16½	18½
Elec. Refrig. cap.†	33½	30½	37½
Elec. Ry. Securities, com.—no par.	6½	....	....
Elec. St. Battery com. $5.25—no par	70½	68½	79½
Elmira Wtr., Lt. & R.R., 7% pf.	100½	99	101½
Emerson Elec., pf.	m105	....	....
Empire Pwr., A $6.	31½	26	31½
Engr. Pub. Serv., $7 pf.—no par.	98½	93½	99½
Engr. Pub. Serv., com.—no par	23½	21½	24½
Eureka Vacuum Cleaner, com. $4—no par.	65	60½	67½
FAIRBANKS MORSE, 7% pf.	k112	107½	112
F.-M., com.—$2.60—no par.	41½	38½	42½
Federal Lt. & Trac., com.†	41½	37½	44½
Federal Lt. & Trac., 6% pf.	93	91½	95
Ft. Worth Pwr. & Lt., 7% pf.	f109½	108	112
GALVESTON-HOUSTON ELEC. 6% pf.	72	68	72
Galveston-Houston Elec., com.	27	....	....
Gen. Elec., 8% com.	84½	81	87½
Gen. Elec., special—10.	11½	11½	11½
Gen. Gas & Elec. (Del.) com. A. $1.50—no par	43½	40½	47½
Gen. G. & E. (Del.) com. B—no par.	m 42½	39	43½
Gen. G. & E. (Del.) pf. A. $8—no par.	k115	115	115½
Gen. G. & E. (Del.) pf. A $7—no par.	k101	100	107½
Gen. G. & E. (Del.) pf. B $7.	99	96	99
Gen. Pub. Serv., $7 pf.	k106	105½	106½
Gen. Pub. Serv., com.	k 12½	11½	14½
Ga. Lt., Pwr. & Rys., 6% pf.	88	87	92
Ga. Lt., Pwr., & Rys., com.	m 60	....	....
Ga. Ry. & Pwr., 8% pf.	k122	119	123
Ga. Ry. & Pwr., 7% pf.	108½	106	108½
Ga. Ry. & Pwr., 4% pf.	m119	....	....
Ga. Ry. & Pwr., 4% com.	120	....	....
Gt. Western Pwr., 7% pf.	h102½	....	....
IDAHO PWR., 7% pf.	103½	103	105
Ill. No. Utilities, 6% pf.	k 88	88	92
Ill. Pwr. & Lt., 7% pf.	100½	99	101
Ingersoll Rand com. $8.	k 92½	92	95½
Int. Combus. Engr., com. $2—no par	56½	43½	64
Int. Util., Class A—$3.50—no par.	k 32½	28	33
Int. Utilities, Class B—no par.	4½	3	5½
Interstate Pwr., pf.—$7—no par.	94	93	97
Interstate Pub. Serv., 7% pf.	99	98	99½
Iowa Ry. & Lt., 7% pf.	97½	97	99
JERSEY CENTRAL PWR. & LT., 7% pf.	98	97½	98½
Jersey Cent. Pwr. & Lt., 7% ptc. pf.	113	111	115
Jersey Cen. Pwr. & Lt., com.—no par	k 25	....	....
Johns-Manville, com.†—no par.	60½	55½	66

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, March 5. lBid price Wednesday, March 9. mLatest quotations available. †Dividend rate variable.

Insurance Companies Heavy Investors

Utility Holdings of Leading Companies Have Increased More than 80 per Cent in the Past Three Years—Limitations to Such Investments

ALTHOUGH now secondary in importance to the savings banks as a market for public utility securities, life insurance companies constitute an extremely important group of investors. At the beginning of the year 52 of these companies, which hold more than 90 per cent of the assets of all United States life companies, had well over $800,000,000 invested in these securities. This represents an increase of 83 per cent since 1924 and indicates the possibility of further vast expansion.

Legislation determining allowable investments of life companies differs widely in various states. So far as utility securities are concerned, it is less rigid generally than that governing savings banks, as discussed in these columns last week. The regulations may be divided into two broad classes —those which permit companies to invest in all securities not definitely prohibited and those which prohibit companies from investing in securities not definitely authorized. The former type of legislation exists in such states as Connecticut and West Virginia, where legislation with regard to investment is at a minimum. It also includes such states as Iowa and Massachusetts, which have extensive restricted funds but no limitations upon the investment of the balance. The second type of legislation is found in such states as New York, which has certain funds very carefully restricted with regard to investment, and states like New Jersey, where there is no differentiation, the same securities being authorized for all funds.

With regard to restriction on investment in public utility bonds, there are certain important differences in detail in the various states. Various tests are applied which are too numerous to discuss in detail. In fact, the tendency is away from specific tests towards a definite analysis of individual cases.

ARMSTRONG COMMITTEE REPORT

The Armstrong committee, in considering the investments of life companies, recently made the following statement:

"It is difficult to draw any satisfactory line with regard to investments in negotiable bonds. It would not be advisable to restrict the investment of life companies in the same manner as those of savings banks. The securities

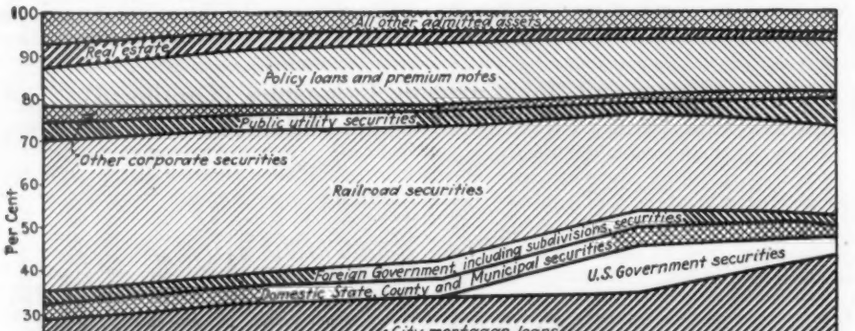
Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday March 8	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	k114	112	114¼
Kansas Gas & Elec., 7% pf.	l104	103	104
Kentucky Hydro-Elec., 7% pf.	a 95½	94½	97½
Kentucky Sec.,6% pf.	82	83	87
Kentucky Sec., 5% com.	107	110	115
Kentucky Utilities, 6% pf.	95	95	96¼
Keystone Pwr. & Lt., 7% pf.	96½	96	98½
LACLEDE GAS LT., 8% com.	140	139	153
Lehigh Pwr. Sec., com.—no par.	18	15½	18¼
Long Island Ltg., 7% pf.	107	107	109
Long Island Ltg., com. $2—no par.	k140	139	153
Los Angeles Gas & Elec., 6% pf.	99	98	100½
Louisville Gas & Elec., cl. A. $1.75	25¼	23¼	26½
MAN. ELEC. SUPPLY, cap. $4.25 —no par	63½	53¼	65
Manila Elec., com.†—no par.	g 40	40	44
Maytag Mfg., com. .50—no par.	25¼	23¼	28
Memphis P. & L., pf.—$7—no par	107½	107	109
Metropolitan Ed., pf.—$6—no par.	93	93	96
Metropolitan Ed., pf.—$7—no par.	105	104	108
Metropolitan Ed., com. $5—no par.	60	....	....
Middle West Utilities, 7% pf.	a108½	....	....
Middle West Util., 7% pr. lien pf.	a118	....	....
Middle West Util., com. $6—no par	a108½	....	....
Midland Utilities, pr. in. 7% pf.	a101	....	....
Midland Utilities, 7% pf. A.	a 98½	97	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	k100	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	k 99	98	101
Minn. Pwr. & Lt., 7% pf.	l104½	104	105
Miss. Pwr. & Lt., $5 pf.	108	106	111
Miss. River Pwr., 6% pf.	97	94	97
Miss. River Pwr., com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7 —no par	99	100	104
Mohawk Hudson Pwr., 2d pf.—$7 —no par.	k 99	98	101½
Mohawk Hudson Pwr., com.—no par	24½	20½	27
Montana Pwr., 7% pf.	m119½	118½	119½
Montana Pwr., 4% com.	86½	....	....
Montreal Pwr., 7% com.	f 74	....	....
Mountain States Pwr., 7% pf.	99	97	101
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	103½	98	105
National Carbon, 8% pf.	a131	....	....
National Elec. Pwr., A†	24	23½	25½
National Elec. Pwr., 7% pf.	a 96½	....	....
National Lt., Ht. & Pwr., com.	24	....	....
National, Light, Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf.—$7—no par	105½	101½	105½
National Pwr. & Lt., com.†—no par.	20½	19½	22
National Pub. Serv., 7% pf.	95	93	96
National Pub. Serv., 7% ptc., pf.	113	108	115
National Pub. Serv., A com. $1.60— no par.	21½	18½	21½
National Pub. Serv., B com.—no par	17½	14	17½
Nebraska Pwr., 7% pf.	l107½	106	108½
Nevada-Calif. Elec., com.	m 25	25	26½
New Brunswick Pwr., 7% pf.	55	....	....
New Eng. Pub. Serv., pr. in. pf. $7.	99	98½	101
New Eng. Pub. Serv., pf. $7.	99	98	100
N. J. Pwr. & Lt., 6% pf.	93	....	....
New Orleans Pub. Serv.—7% pf.	104	103	105
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	....	....
N. Y. Central Elec., 7% pf.	102	102	104
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., 7% pf.	109	....	....
Niagara Falls Pwr., 7% pf.—25.	k 28½	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	111	110½	113
No. Amer., 6% pf.—50.	50½	50	51½
No. Amer., com.—10.	47½	45½	50½
No. Amer. Edison, $6 pf.—no par.	98½	96½	100½
No. Amer. Lt. & Pwr., 7% pf.	101	100	104
No. Caro. Pub. Serv., pf.—$7—no par	94	93	97
Northeastern Pwr., com.	16½	16½	18½
No. Indiana Gas & Elec., 7% pf. A.	103	102	104
No. N. Y. Utilities, 7% pf.	104	103	105½
No. Ohio Pwr., com.—no par.	12½	9½	13½
No. Ohio Trac. & Lt., 6% pf.	80	78	81
No. Ohio Trac. & Lt., 7% pf.	90	90	93
No. Ont. Lt. & Pwr., 6% pf.	86	84	90
No. Ont. Lt. & Pwr., 4% com.	74	73	78
No. States Pwr., (Wis.) 7% pf.	103	....	....
No. States Pwr., (Del.) 8% com.	k113½	109½	113½
No. Texas Elec., 6% pf.	66	65	70
No. Texas Elec., 4% com.	35	27	36
OHIO BRASS, com. B $4—no par.	83	74	85
Ohio Brass, 6% pf.	100	100	103
Ohio Gas & Elec., 7% pf.	95	95	97
Ohio Pwr., 6% pf.	97½	96	99
Ohio Pub. Serv., 6% pf.	k 95	95	96½
Ohio Pub. Serv., 7% pf.	k104	103	105½
Ohio River Edison, 7% pf.	105½	103	105½
Oklahoma Gas & Elec., pf.	98	....	....
PACIFIC GAS & ELEC., 6% pf.	25	24½	26½
Pacific Gas & Elec., 8% new com.	32½	31	33
Pacific Pwr. & Lt., 7% pf.	l102½	102	104
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Cent. Lt. & Pwr., $5 pf.—no par.	c 73¼	71½	73¼
Penn-Ohio Edison, 7% pf.	99½	98	100
Penn-Ohio Elec., 7% pf.	95	95	96
Penn-Ohio Pwr. & Lt., 7% pf.	99	99	102
Penn-Ohio Pwr. & Lt. 8% pf.	107	109	112
Penn Pwr. & Lt.—$7—no par.	l108½	107	108½
Penn Pub. Serv., 7% pf.	103	....	....
Penn. Pub. Serv., 7% pf.	87	....	....
Penn Wtr. & Pwr., 8% com.	e178½	176	185
Phila. Co., 6% pf.—50.	k 51	50	53
Phila. Co., com.—50.	91	85½	92
Phila. Elec., 8% com.—25.	c 46½	....	....
Portland Elec. Pwr., 7% pf.	98	97½	100
Portland Elec. Pwr., 6% pf.	81	81	83
Portland Elec. Pwr., 6% 2d pf.	65	68	70
Portland Elec. Pwr., com.	25	28	30
Potomac Elec. Pwr., pf.	j108½	....	....
Pwr. Corp. of N. Y., com. $1—no par	m 79	....	....
Pwr. Sec., pf.—no par.	k 30	28	33
Pwr. Sec., com.—no par.	k 5	5	8
Public Serv. of Colorado, 7% pf.	l 97	....	....
Pub. Serv. of N. J., 7% pf.	k109	108½	110½
Pub. Serv. of N. J., 8% pf.	k126½	125	127½
P. S. of N. J., $5 com.—no par.	34½	32	35½
Pub. Serv. of No. Ill., 6% pf.	a103½	102	105
P. S. of No. Ill., com. $8—no par.	a133½	130½	136
Pub. Serv. of No. Ill., 8% com.	a134	132	136
Pub. Serv. of Okla., 7% pf.	99	99	100½
Pub. Serv. Elec. & Gas, 6% pf.	103½	102	105½
Pub. Serv. Elec. Pwr., 7% pf.	115½	113½	115½
Puget Sound Pwr. & Lt., 7% pf.	105	....	....
Puget Sound Pwr. & Lt., 6% pf.	84	....	....
Puget Sound Pwr. & Lt., com.	29	29	33½
RADIO CORP. OF AMER., pf.—50.	51½	50½	53
Radio Corp. of Amer., com.—no par.	52½	47½	56½
Republic Ry. & Lt., pf.	k120	....	....
Republic Ry. & Lt., com.	121	112	135
Rochester Gas & Elec., 6% pf. D.	k102½	101	103½
Rochester Gas & Elec. 7% pf. B.	106	105	107
Rochester Gas & Elec.,7% pf. C.	101½	....	....
SAFETY CABLE, com. $4	62½	52½	63½
San Joaquin Lt. & Pwr., 7% pf.	106	105	108
St. Joseph Ry., L., H. & P., 5% pf.	70	70	73
Servel Corp.	9½	7½	10½
Sierra Pacific Elec., com.	24	....	....
Sioux City Gas & Elec., 7% pf.	101	99	101½
Southeastern Pwr. & Lt., pf.—$7 no par.	103	....	....
Southeastern Pwr. & Lt., $6 ptc. pf.	70½	....	....
Southeastern Pwr. & Lt., com.—no par.	30	29½	38½
So. Calif. Edison, 8% pf.	36½	36½	38
So. Calif. Edison, 7% pf.	k 27½	27	28½
So. Calif. Edison, 6% pf.	k 24½	24½	25½
So. Calif. Edison, 8% com.	33½	....	....
Southern Cities Utilities, 7% pf.	k 83	81	86
Southern Cities Utilities, com. $4.	25	....	....
Southwestern Lt. & Pwr., A $3.	63	60	65
Southwestern Lt. & Pwr., B.	63	60	65
Southwestern Lt. & Pwr., $6 pf.	85	83	86
Southwestern Pwr. & Lt., 7% pf.	k105	103	105½
Springfield (Mo.) Ry. & Lt., 7% pf.	97	95	100
Standard Gas & Elec., 8% pf.	59	....	....
Standard Gas & Elec., 7% pf.	106	103	106½
Standard G. & E., com. $3—no par.	56½	54	57½
Standard Pwr. & Lt., 7% pf.	98	98	100
Staten Island Edison, pf.—$6—no par.	99	99	101
Superheater, $6 com.—no par.	178	170	185
Syracuse Lighting, 7% pf.	102	103	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, 8% com.	300	....	....
TAMPA ELEC., com. $2.	59½	49	62½
Tenn. Elec. Pwr., 6% pf.	94	92	94½
Tenn. Elec. Pwr., 7% pf.	106	103	106½
Terre Haute, Ind. & East. Trac., 5% pf.	20	20	25
Terre Haute, Ind. & East. Trac., com	1	1	3
Tex. Pwr. & Lt., 7% pf.	l107½	106	108
Tide Water Pwr., 8% pf.	105	105	108
Timken Roller Bear., com.—$4 no par.	86½	78	95½
Toledo Edison, 8% pf.	k115½	115	118
Toledo Edison, 7% pf.	k107½	105	108½
Toledo Edison, 6% pf.	l 95	94½	95
Toledo Edison, 6% com.	k100	....	....
Tri-City Ry. & Lt., 6% pf.	96	90	97
UNITED GAS & ELEC., 6% pf.	98	98	99½
United Gas & Elec., com.—no par.	m 57	....	....
United Gas & Elec. (N. J.) 5% pf.	71	70	73
United Gas Impr., 8% com.—50.	c 50½	....	....
United Lt. & Pwr., pf.—$4—no par.	50½	49	53½
United Lt. & Pwr., pf.—$6.50—no par.	91	87	93½
United L. & P., com. A .48—no par.	12½	12½	15½
United L. & P., com. B .48—no par.	k 15	16	18
Utah Pwr. & Lt., 7% pf.	l105½	104	105
Utica Gas & Elec., 7% pf.	105	105	106½
Utica Gas & Elec., 8% com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	93	93	98
Utilities Pwr. & Lt., com. A $2.	28	....	....
Utilities Pwr. & Lt., com. B $1—no par.	k 14½	13½	15½
VERMONT HYDRO-ELEC., 7% pf.	96½	95	97½
Virginia Elec. & Pwr., 7% pf.	105½	105	107
Virginian Pwr., 7% pf.	108	....	....
Virginian Pwr., com.	70	....	....
WAGNER ELEC., 7% pf.	b 70	68	74
Wagner Elec., com.†—no par.	b 20½	18½	24
Washington Ry. & Elec., 5% com.	j202½	....	....
Washington Ry. & Elec., 5% pf.	j 91	....	....
Washington Wtr. Pwr., 8% com.	138	136	140
West Mo. Pwr., 7% pf.	m92	....	....
West Penn Elec., 7% pf.	106½	102	107½
West Penn Elec., Cl. A $7.	k102½	97½	103
West Penn Pwr., 7% pf.	114	111	114
West Penn Pwr., 6% pf.	103	100½	103
West Virginia Lt., Ht. & Pwr., 7% pf.	93	94	96
West Va. Utilities, 7% pf.—50.	50	48	51½
Western Pwr., 7% pf.	100	....	....
Western States Gas & Elec., 7% pf.	96	92	94½
Western States Gas & Elec., com.	17	....	....
Westinghouse Elec. & Mfg., 8% com. —50.	72½	67½	75½
Weston Elec. Instrument, Cl. A $2.01 —no par.	k 33	30½	34½
Weston Elec. Instrument, com.—no par.	17½	15	18½
Wheeling Elec., 6% pf.	96	95	97
Wis., Pwr., Lt. & Ht., 7% pf.	k 95	95	97
Worthington Pump, 7% pf. A.	k 53½	46	54½
Worthington Pump, 6% B.	k 44½	40	45
Worthington Pump, com.	26½	20½	31½
YALE & TOWNE com. $5—25.	75	70½	75

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, March 5. lBid price Wednesday, March 9. mLatest quotations available. †Dividend rate variable.

available for investment under such limitations would not be large enough in amount to furnish a sufficient field for the profitable investment of the large accumulations of insurance corporations. It has been feared that such a restriction would prove to be too severe and might operate so far to increase the demand for the favored securities as to preclude a satisfactory rate of income. After much reflection upon this subject the committee is of the opinion that no satisfactory line can be drawn with reference to investment in bonds, other than collateral trust bonds, without hampering the companies in the enjoyment of that reasonable freedom of investment necessary to insure the return upon which the calculations of their risks are based. Investments in collateral trust bonds where the greater part of the security



UTILITY SECURITY HOLDINGS HAVE SHOWN RAPID INCREASE DURING PAST FIVE YEARS

consists of the hypothecated stocks of corporations should not be permitted."

The committee recommended that investments in bonds secured to the extent of more than one-third of their value by the deposit of corporate stocks should be prohibited. New York legislation, which frequently has been copied by other states, restricts life companies to bonds secured by adequate collateral securities; not more than one-third of the total value of these securities shall consist of shares of stock. In certain states, moreover, there are limitations based on the record of the company in regard to dividends and on defaults in payment of interest or principal. There are also numerous prohibitions against holding stock, and these vary widely in the different states. Such holdings of stock at the beginning of the current year amounted to only about $80,000,000 out of the total of $819,000,000.

Many of the states have established restrictions on the amounts which may be placed in a single form of investment and also the proportion of the assets of any company which may be invested in a single investment or a single class of investments. Typical of this is a requirement that no company shall invest more than 10 per cent of its capital and surplus in a single corporation. Such legislation applies to life companies in Georgia, Idaho, Massachusetts and Oklahoma. Wisconsin provides that no insurance company shall invest more than 10 per cent of its admitted assets in the stock or securities of any one corporation. Other similar prohibitions exist in the legislation of the various states.

Keeping in mind the restrictions which must be observed, investment officials of insurance companies concerned have their own series of tests by which they judge the merit of various issues. Usually the analysis is very rigid. The condition of the property generally ranks first among the factors to be considered. This is studied from first-hand examination rather than by the application of arithmetical ratios which were formerly relied upon. The position of the company, geographically, is also considered with the watershed situation, the nature of the population served and the probable increase therein. Studies of the cost of generation and the possibility of future competition are included. Some of the more careful investment officials go back to the question of the natural resources of the territory to learn whether or not the district served can continue to support the present or an increasing population and whether such population can support the utility. This involves the question of the presence of manufacturing and other industries in the neighborhood. Then there is also the question of what depreciation is allowed. Obviously, in the case of new property the question of depreciation may not be a guide, since new companies frequently do not yield sufficient income during the first few years to provide for depreciation.

The financial set-up and earnings of a company are carefully examined in all cases. Various ratios are applied to the earnings and financial set-up, but are considered in relation to an examination of the property.

Public relations are always regarded as extremely important. One of the life companies considers this of equal importance to the physical condition of the property and therefore makes a point always to make a first-hand study of the status of the company with regard to its relations both with customers and with the community as a whole. This, of course, involves the question of management. Other factors, such as the franchises, the condition of the mortgages and the indenture under which issues are made, are studied carefully. As the position of the utilities strengthens, the analyses are naturally less rigid. Certain financial practices are severely frowned upon by investment officials and the bonds of certain companies are avoided accordingly. In general, however, investment in utility stocks by insurance companies is increasing steadily and rapidly, as the utilities study institutional investment requirements and as the institutions tend to modify their more rigid requirements.

Customer Sales Reach $27,035,000 in December

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to their customers and employees, it is estimated that during December a total of 310,000 shares were sold in this manner. The value of the stock is estimated at $27,035,000. A total of 50,900 customers took part in the sales during December.

These sales exceed in value those of any previous month in 1926 except March, when sales were slightly greater. The same is true of the number of customers buying stock. The value of the shares was 38 per cent higher than the November sales and 32 per cent above the sales for December, 1925. It should not be assumed from these figures that sales in the latter part of 1926 exceeded those of the corresponding period in 1925; the sales for November and December combined, in fact, fell off about 10 per cent. The upward movement in December, 1926, was paralleled by a similar movement a month earlier in 1925.

Company Reports

Name of Company	Gross Earnings Twelve Months Ended Jan. 31 1927	1926
American Wtr. Wks. & Elec.	$45,790,401	$41,597,097
Baton Rouge Electric	97?,374	810,898
Blackstone Valley Gas & El.	5,566,986	5,099,192
Cape Breton Electric	622,033	566,277
Cities Service	26,682,396	25,688,084
Edison Elec. Illg., Brockton	1,784,213	1,675,866
Electric Light & Power of Abington & Rockland	579,233	546,941
El Paso Electric	2,863,182	2,570,632
Electrical Securities*	977,635	906,658
Florida Public Service	1,701,794	1,123,302
Fort Worth Power & Light	2,862,832	2,838,824
Galveston-Houston Electric	4,671,420	3,946,408
Idaho Power	2,869,474	2,829,258
Illinois Power	2,589,739	2,510,046
Lowell Electric Light	1,729,669	1,634,189
Nebraska Power*	4,397,178	4,165,173
New Bedford Gas & Ed. Lt.	4,185,518	3,983,526
North Texas Electric	2,525,290	2,447,803
Pacific Power & Light*	3,751,266	3,545,421
Puget Sound Power & Light	13,615,677	12,913,522
Savannah Electric & Power	2,240,597	1,982,736
Sierra Pacific Electric	1,266,230	1,135,114
Tampa Electric	4,882,744	3,502,399
Texas Power & Light*	7,794,378	6,898,306
Washington Water Power	6,073,310	5,862,019

* Year ended Dec. 31, 1926 and 1925.

New England Public Service Dividend Rate Increased.—Directors of the New England Public Service Company have declared the regular quarterly dividend of $1.75 a share on the prior lien preferred stock, payable March 15 to holders of record Feb. 28. There will also be paid a dividend for the three months ended Feb. 28, 1927, of 45 cents per share on the common stock, no par value, payable March 31 to holders of record Feb. 28.

Manufacturing and Markets

Improved Fractional-Horsepower Motors

Joint Committee Meeting of Power Companies, Motor and Appliance Manufacturers' Associations Finds Partial Solution of Small-Motor Problem

A BIG step toward a mutually satisfactory agreement upon ways and means of bringing about the more general use of fractional-horsepower motors of higher efficiency and power factor when used on appliances operated on lighting circuits was taken at the joint committee meeting of motor manufacturers, power companies and appliance manufacturers held at Detroit on March 3. This was the first meeting of the joint committee appointed to consider the present situation regarding fractional-horsepower motors and was the outgrowth of two previous informal conferences, details of which were published in the ELECTRICAL WORLD for July 3, 1926, page 43, and Feb. 5, 1927, page 327.

At the last previous conference, held on Jan. 26, it was decided to invite motor and appliance manufacturers empowered to speak for their interests to join with the power companies, and the following associations and manufacturers were accordingly represented: National Electric Light Association, National Electrical Manufacturers' Association, Association of Edison Illuminating Companies, Refrigerating Manufacturers, American Washing Machine Association, Ironing Machine Association and American Association of Oil Burners.

In outlining the purpose of the joint committee meeting C. F. Hirshfeld pointed out that the uncontrolled introduction of many small motors on lighting circuits had brought new problems to the power companies and that the co-operation and assistance of the appliance manufacturers and motor manufacturers had been enlisted as vitally necessary in obtaining the use of motors with better and more efficient electrical characteristics in situations where such improved characteristics are justified. In working toward the desired improvements it is obvious, Mr. Hirshfeld said, that various appliances are used under entirely different conditions; for instance, the operation of electric refrigerators and oil burners is entirely different from that of washing and ironing machines. Refrigerators and oil burners start and stop frequently, have comparatively long hours of operation and use considerable energy; therefore the starting current, power factor and efficiency are significant. On the other hand, washing and ironing machines are frequently installed in the basement and usually operate off the lighting peak. Power factor and efficiency, because of the intermittent and relatively short-hour use of these appliances, are not so important, but high starting current has been the cause of serious complaints of voltage fluctuation and flickering lights.

In order that the work of the joint committee may be freed of any possible bias on the part of the chairman because of his affiliation with any one of the groups represented, L. W. W. Morrow, managing editor of the ELECTRICAL WORLD, was chosen as chairman to carry on the work, which up to this time has been handled by Mr. Hirshfeld.

PROBLEMS TO BE SOLVED

A round-table discussion emphasized the problems which must be overcome by the utilities, the motor manufacturers and the appliance manufacturers. Briefly stated these are:

Utility companies are finding that the increasing number of motor-driven household appliances being used is affecting customers' service conditions when started during normal lighting hours. It is not always possible for the power company to correct or compensate for this condition by the installation of heavier service wires or secondaries, the investment in which is not justifiable. Wiring on the customer's premises is often inadequate, and this is an important factor in the operation of small motors on lighting circuits. A number of companies already have adopted and others are considering the adoption of a rule restricting the starting current of any motor connected to 110-120-volt lighting circuits to 15 amp. At the same time, it is the power companies' desire that any increase in cost entailed in a change in appliance motors shall be minimized so that the sale and use of appliances will not be retarded.

Motor manufacturers pointed out that they are confronted by the necessity of meeting the specifications of appliance manufacturers, which are not always compatible with increasing the power factor and efficiency of the motor. Some of the conditions to be met are excessive low voltage in some localities, high starting loads on some appliances requiring high starting torque, space limitations and price. Greatly increased apparent efficiency could only be obtained at considerable increase in cost.

Appliance manufacturers felt that to use a motor costing considerably more than those now used would tend to reduce sales in that it would introduce increased sales resistance in the form of increased retail price to the ultimate purchaser.

It was the sense of the discussion that the problems could best be solved by each group recognizing the limitations of the other and effecting a compromise which would be mutually agreeable without putting all of the burden upon the power company, the motor manufacturer or the appliance manufacturer. For the purpose of more readily determining the logical steps looking to improvement in the electrical characteristics of fractional-horsepower motors it was decided that two sub-committees should consider the requirements to be met under the two general classes of application; that is, first, motors which start and stop frequently, have comparatively long-hour operation and use considerable energy such as on refrigerators and oil burners, and, second, motors operating intermittently and using a relatively small amount of energy, such as those on washing and ironing machines.

E. T. Williams, consulting engineer for the Servel Corporation, was appointed chairman of the committee to study the motor situation as applied to refrigerators and oil burners, and T. W. Behan, general manager of the 1900 Washer Company, was appointed chairman of the committee on washing and ironing machine motor application. Each committee was composed of representatives of the motor manufacturers, the power companies and the respective appliance manufacturers. It was possible for these committees to take definite action in recognizing the requirements to be met and the limitations beyond which it was deemed economically impracticable to go at this time.

SPECIFICATIONS AND LIMITATIONS

The committee on refrigerator and oil-burner application approved and recommended the following specifications and limitations as applied to fractional-horsepower motors:

"1. These specifications apply to motors which are normally connected to lighting circuits and which may be expected to operate at times during the lighting hours.

"2. The ¼-hp. motor shall have at least such full-load efficiency and full-load power factor that the product of these two values, known as the apparent efficiency, shall not be less than 42 per cent. Such test to be obtained after reasonable running time (at least 24 hours) to limber up motor. The values for other sizes shall be adjusted accordingly. This is to become effective Jan. 1, 1928, or as soon before that date as practicable; also, these requirements shall be considered to apply only to 1,800-r.p.m. motors.

3. It is desired that as rapidly as possible motors shall be produced which in the 1,800-r.p.m. ¼-hp. size shall have a full-load efficiency of at least 70 per cent and a full-load power factor of at least 65 per cent, giving an apparent efficiency of at least 45.5 per cent.

Sales of Washing Machines by Quarters 1923-1926 (Except Electrics)

Electric Washing Machine Sales Shown Separately
(Data Supplied by American Washing Machine Manufacturers' Association)

Quarter	Hand-Power Machines				Gas and Power Machines				Water-Power Machines				Total Including Electric Machines			
	1923	1924	1925	1926	1923	1924	1925	1926	1923	1924	1925	1926	1923	1924	1925	1926
First	35,317	22,079	25,174	26,854	5,934	3,803	6,762	13,742	7,352	4,732	5,475	7,228	179,058	179,461	197,764	238,749
Second	30,811	20,470	25,314	24,516	6,319	4,310	9,034	19,103	7,758	4,023	5,844	8,226	188,176	180,227	230,799	272,490
Third	30,212	19,036	22,348	20,293	4,289	3,987	10,431	9,039	6,947	5,078	5,665	8,518	172,964	187,402	234,580	254,512
Fourth	19,063	20,748	20,922	17,905	3,568	4,842	9,518	14,645	6,498	3,729	3,789	5,299	167,726	181,802	219,356	253,302
Total	105,403	82,333	93,758	89,568	20,110	16,933	35,745	56,529	28,555	17,562	20,773	29,271	707,924	728,892	882,499	1,019,053

"4. No motor (either repulsion, split-phase or other type) intended for use on 110-120-volt circuits should have a starting current of more than 15 amp. If a motor is of such a capacity or has such characteristics that it would require more than 15 amp. to start, it should be made for 220-volt service. The locked rotor value of current shall not exceed 20 amp.

"5. Motors should be so connected to appliances that unnecessary noise is avoided, so that bearings are readily accessible for oiling and so that all parts which may require attention may be reached and inspected readily."

Thus this committee agreed with some slight modifications upon the specifications for fractional-horsepower motors which had been suggested at the conference on Jan. 26.

Further Study of Intermittent-Duty Motors

The committee on intermittent-duty motor application was faced with more complicated problems, and it was decided to carry out a further investigation of the situation before making specific recommendations. The investigation will be made along the following lines:

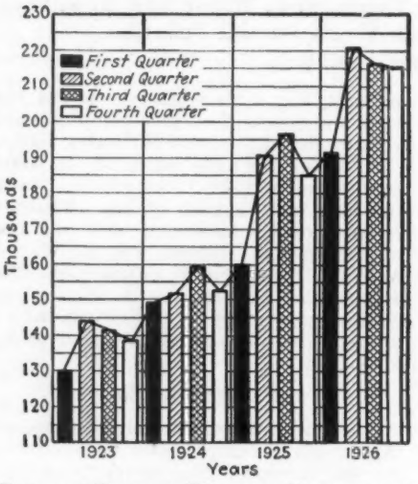
1. Investigation of when and where washing machines are used.
2. Washing and ironing machine manufacturers will give motor manufacturers their starting, running and pull-out torque requirements.
3. Motor manufacturers taking these data will ascertain what improvements can be made in split-phase motors and the consequent change in price.
4. Central-station representatives will submit an exhibit of installation costs borne by central-station companies involved in connection of washing or ironing machines to their lines.

Another meeting of this committee will be called as soon as the above information is available, when it is expected that definite recommendations on small-motor specifications can be made.

At the close of the meeting it was the consensus of opinion that remarkable progress had been made toward a satisfactory agreement upon the fractional-horsepower motor problem, particularly in view of what had at first appeared to be a wide divergence of interest on the part of the power companies, motor and appliance manufacturers.

Current Interruption Insurance Available

Insurance against interruption to electric current has been instituted by the Royal Indemnity Company, 84 William Street, New York, and it has been approved, effective Feb. 15, 1927, in the states in which the company writes machinery insurance. The company in its policy agrees in consideration of the premium specified, that if by a breakdown of a public service electric light and power system occurring within the policy period specified the insured designated is deprived of usable electric current needed in the conduct of his business on the premises described, it will pay the insured, as indemnity for loss so sustained, the amount set forth for each hour or that part of a period of deprivation in excess of fifteen minutes, such amount to be prorated for fractions of an hour and for partial deprivation of current.



Sales of Electric Washing Machines by Quarters, 1923-1926

Note.—During the month of September sales of electric washing machines amounted to 76,308 and established a new monthly sales record in the history of the washing machine industry.

Sales Statistics on Direct-Current Motors

Orders entered for direct-current motors during the month of December were slightly below those entered for the previous month. Smaller sales were recorded during the months of May and July. December sales were below the average, approximately $844,600, for the year. It is expected that during 1927 the number of units and the aggregate horsepower will also be included in these sales statistics.

ORDERS ENTERED AND SALES BILLED FOR DIRECT-CURRENT MOTORS

(1-hp. to 200-hp. inclusive, built in general-purpose motor frames, including control equipment sold with motors and excluding spare parts.)
(Issued by National Electrical Manufacturers' Association—Apparatus Division)

Month, 1926	Orders Entered	Billings
January	$815,976.75	$934,124.01
February	878,028.36	807,281.31
March	1,167,748.91	1,027,318.84
April	866,858.52	821,946.62
May	740,231.54	793,832.28
June	904,269.40	928,272.41
July	740,424.22	876,257.25
August	792,613.03	876,296.67
September	937,913.01	745,782.97
October	801,035.97	837,214.13
November	745,628.53	897,262.36
December	744,424.39	907,971.45
Year to date	$10,135,152.63	$10,453,560.30

Business Conditions

UTILITIES in all sections are busy with construction programs and are placing orders for equipment and materials. Transmission line and distribution equipment is in demand and items such as transformers, outdoor substations, oil breakers, air-break switches and cables are active. A large construction program for the summer is planned and business for electrical manufacturers should continue in good volume.

Business in industrial lines is fair and a revival of buying in the steel, textile, paper and automotive industries has created a better demand for motors, transformers and wiring supplies. Industrial electric heating equipments are in active demand and this business promises to continue in good volume. Appliances and other electrical merchandise are in demand in preparation for the spring and summer sales campaigns. Refrigerator and range manufacturers expect splendid business this summer and factories are busy on production.

In general lines there appears to be a 10 to 12 per cent increase in business this year as compared to the corresponding period of last year and prospects are that this increase will be maintained.

Metal Markets Quieter and Prices Steady

Buying in the non-ferrous metal markets was on a considerably reduced scale during the week ended Wednesday. There appears, however, to be general agreement that the industrial outlook is distinctly better than it was a month ago, and producers are in an optimistic attitude. Following five successive weeks of active buying in the domestic copper market has come a decided lull. Producers are in an easy position, but at the same time consumers for the most part are well sup-

NEW YORK METAL MARKET PRICES

	Mar. 2, 1927 Cents per Pound	Mar. 9, 1927 Cents per Pound
Copper electrolytic	13⅛	13.35–13.375
Lead, Am. S. & R. price	7.55	7.65
Antimony	13⅛	12.5
Nickel, ingot	35	35
Zinc spots	7.15	7.10
Tin, Straits	69¼	70¼
Aluminum, 99 per cent.	26	26

Base copper price March 9, 1927, 15¼ cents.

plied and are content to await developments. Such sales as were made brought 13.375 cents in Connecticut, with Midwest business commanding an eight and in some instances a quarter of a cent over the Eastern figure. Official and semi-official statements from authoritative sources make it certain that many of the large producers are curtailing output, and unless unexpected increases from other sources offset these decreases, a net reduction of from 10 to 15 per cent in the world's production should materialize. Little change occurred in the zinc market, though prices were a little easier than a week ago. High-grade is dull at 8¼ cents delivered in New York. The American Smelting & Refining Company surprised the trade by advancing its contract price of New York lead from 7.55 cents to 7.65 cents on March 3, following an advance of fifteen points made the day before. Prices in the Middle West have been very mixed, depending on the seller and the time of delivery. The tin market has not been active. Prices for prompt Straits early in the week were much under London parity.

Electrical Business Satisfactory in Southeast

Electrical interests report generally satisfactory business during the past week with few outstanding features. The largest order reported was from a central-station company in the western part of the territory for power transformers totaling $100,000. There are several sizable orders for line-construction materials pending which will undoubtedly be placed within the next two weeks, but last week only a reasonable number of small orders for stock requirements were reported in this line. Some very satisfactory switchboard equipment business is also in immediate prospect. The pushing of the electric sign activity by power companies is reflected in two recent installations ordered in one town, one being a sign 110 ft. by 36 ft., to cost $10,000, and the other a 42-ft. vertical sign, which will cost approximately $6,000. Central-station spring campaign activities are stimulating all lines of appliances, particularly flatirons, waffle irons, washing machines and vacuum cleaners, one company having sold 1,272 waffle irons in an eight-day campaign just ended.

Activity in the industrial field is confined largely to the textile group, and two orders received last week from textile firms called for $85,000 worth of motor equipment, one order amounting to $45,000 and the other to $40,000. Two large industrial wiring contracts were let last week, presaging satisfactory orders for wiring materials. An order was also placed last week by a steam-railroad company for $30,000 worth of motors and wiring materials to go into a repair shop, this being the first major activity in this field since the first of the new year.

Good Volume of Buying Around St. Louis

Central-station buying has continued in good volume in the St. Louis district. One order has been placed during the past week for transformers, circuit breakers and other switchboard equipment aggregating about $120,000. Two local orders for industrial substations amounting to $3,000 are reported. A shipment of motors rated at from 5 hp. to 50 hp. has been made to the southeastern part of this district. The combined cost was more than $4,000. Some of these motors were for industrial-plant service and others for pumping in the rice fields. Other manufacturers report only the regular volume of orders that are filled from stock. Line-construction material has not started to move out in large quantity. With the jobbers the business appears to be somewhat spotty, some reporting it quiet but hopeful and others saying that to date 1927 business is 10 to 12 per cent ahead of 1926.

Motors in Demand in New York Territory

Transformer sales have improved this month in the New York district, distribution apparatus being in good demand and some sales being reported of transformers ranging in size from 1,000 kva. to 2,000 kva. Switching equipments, too, are more active, and one manufacturer reports an increase of 20 per cent so far this year over last year. Poles, cross-arms and line hardware are fair, but individual orders are generally small. One manufacturer reports sales of circuit breakers to have fallen off decidedly since the first of the month and that inquiries in this line are not being received in any great volume. Motors for pumps, refrigerators, machine tools and general industrial purposes continue in good demand, particularly in the 3-hp., 5-hp. and 10-hp. sizes, and one manufacturer says that his sales for February exceed those for any corresponding period in the past. Control apparatus is slower, but has shown some improvement during the past week.

New England Buys in Good Volume

Many small orders for electrical supplies and equipment were received by manufacturers throughout the New England district during the past week, with small switches and control apparatus in good demand. One manufacturer records an order for inside control and switch equipment amounting to about $15,000 for a plant in Vermont; another reports an order for control apparatus amounting to about $18,000, and many orders in small lots are reported for small switches for substation replacement and expansion.

Small-motor orders are steady and reached over $50,000 in amount for the past week. A number of appliance manufacturers have recently placed fractional-horsepower-motor orders, and electric tool manufacturers are interested.

Industrial electric heating continues active. One prominent manufacturer expects to receive a number of large orders from satisfactory negotiations which will reach $125,000. Electric welding equipment is in good demand, with sales ahead of last year and garage units attracting attention. Electric street-lighting orders will be closed shortly for a number of installations.

Appliance sales are showing a steady trend, with sales volume about equal to that of last year for the first quarter.

Middle West a Little Anxious Concerning Coal

Good business continues in most sections of the Middle West. Some apprehension is felt regarding the bituminous-coal situation, and a tie-up of operations will undoubtedly affect general business in the coal regions. Industrial activity continues favorable, with considerable construction work in view. Indications from the large mail-order houses are that the agricultural trade has fallen off somewhat, although wholesalers report average business. Utility companies are busy preparing for spring construction, and an appreciable amount of apparatus is being purchased. Among the orders placed this week were the following items: Thirty 600-amp., 15-kv. single-pole, single-throw oil circuit breakers; eight 16,000-amp., 250-volt, direct-current, four 4,000-amp. and four 3,000-amp. air circuit breakers; four 60-cycle, four-element-type high speed recorders; one 3,850-kva. three to six-phase air-blast transformer; eighteen 15,000-volt, 250-to-5 current transformers. There has been a good demand for weatherproof wires and cables together with pole-line hardware and poles. Jobbers report good business. Most appliances are moving readily, and as this is "waffle-iron month," sales efforts are being directed toward this appliance. Prices remain generally firm.

Pacific States Report Excellent Industrial Orders

Industrial business is excellent on the Pacific Coast and includes such orders as $3,000 worth of assorted line material for an irrigation district, 25 miles of telephone line for an Oregon lumber company, three synchronous exciter sets of 450 hp. each for compressor drives in an oil refinery—this equipment approximating $15,000 in value—and a traction elevator unit for a San José building which it is estimated will cost $5,000. The cement plants continue to furnish excellent business, a Yosemite plant being in the market for $2,500 worth of standard wiring material and a Redwood City plant being increased in capacity by two large steel kilns.

Railroad orders include operating motors and special control for an auto-ferry-slip apron, approximate value of equipment to be $4,000. Power-company orders are rather quiet, but in April there will probably be placed an order for the Oakland turbine installa-

tion of the Pacific Gas & Electric Company. This will comprise a turbine, boiler and auxiliaries, bringing the amount close to $1,000,000. Pumping-motor business is late this year, having been delayed by the rains.

In the Puget Sound district the Allis-Chalmers Manufacturing Company and the Canadian General Electric Company are reported to have secured jointly the contract for electrical equipment for a million-dollar hydro-electric plant being erected on the Kootenay River near Nelson, British Columbia, by the West Kootenay Light & Power Company. According to the report the Allis-Chalmers company received the award for three waterwheels, each capable of delivering 24,000 hp. with a 75-ft. head of water. The remainder of the order, including the contract for three direct-connected 20,000-hp. generators, switchboard and control apparatus, is rumored to have been turned over to the Canadian General Electric Company. A Northwest central station during the week purchased six 300-kva., three-phase capacitors, costing about $30,000, and another utility announced that plans had been completed for a proposed transformer station to supply energy for an industrial district. Motor sales, announced by several jobbers, include 150 motors from 375 hp. down for lumber mills, dry kilns, irrigation, refrigeration installations, etc. The largest motor sale reported was 450 hp. for a skidder for the Snoqualmie Falls Lumber Company. Specifications are expected in ten days for 100 motors ranging from 300 hp. down for a lumber mill in Everett, an installation which when completed will cost about $500,000.

Activities of the Trade

Welsbach Refrigeration Division Announces Sales Activities

A new organization has been created to handle Welsbach refrigerating products, manufactured by the Welsbach Company, Gloucester, N. J., exclusively in Brooklyn, Richmond and Long Island, N. Y. The corporation is known as the Domestic Distribution Corporation. The sales plan is said to contemplate a retail selling force of 121 men the year round, with a very extensive dealer set-up. The company also announces the appointments of C. B. Ryan, Jr., as manager of its service and sales promotion department; T. H. Cahill, formerly New York retail sales manager for the Servel Corporation, as sales manager of the refrigeration division of the New York branch, and A. B. Hatch as manager of the public utility relations department.

Frigidaire Establishes New Sales Branches

The Frigidaire Corporation has announced the formation of a number of new distributorships and sales branches in various parts of the United States, together with other changes to facilitate its sales activities. New operations have been instituted in Albany, Rochester and Syracuse, in territory formerly handled by the New York City distributor. The Refrigeration Equipment Company, L. C. Feathers, president, has been appointed distributor for Albany and fourteen neighboring counties and the H. C. Gilbert Appliance Company has been appointed distributor for Rochester and nine surrounding counties. A sales branch has been opened at Syracuse for that city and fourteen contiguous counties, with W. L. Jersey as branch manager.

The Charleston (W. Va.) sales branch has been moved to Huntington in order to get better shipping facilities and also to establish headquarters nearer the center of the territory to be covered. The branch manager is W. A. Trolan. A new branch has been opened at Flint, Mich., with C. W. Martin as manager. That branch will handle all Frigidaire business in 28 counties in the eastern half of the lower peninsula excepting the Detroit metropolitan area. The W. E. McClurg Company of Portland, Ore., has been appointed a Frigidaire distributor for that city and ten surrounding counties.

Westinghouse Awarded Coast Guard Contract

A contract has been awarded to the Westinghouse Electric & Manufacturing Company by the United States Coast Guard for furnishing electrical machinery for three new cutters at a cost of $106,700 per ship. The equipment will consist in each case of a turbo-generator with an output of 3,220 hp., a synchoronous propelling motor of 3,000 hp., two auxiliary turbo-generator sets, each set consisting of 300-hp. turbines, a 100-kw. direct-current generator and a 100-kw. alternating-current generator, control panels for propelling machinery, distribution switchboards for lights and auxiliary power, and several auxiliary motors which will be required for the operation of the ships.

Pyle-National Offers a New Floodlight Engineering Service

The increasing use of outdoor floodlight illumination and the need for an engineering service which can work out proper system design, effect the economies possible through careful co-ordination of the equipment used and, where necessary, supply expert supervision of installation, has led the Pyle-National Company of Chicago to the establishment of a new floodlight engineering service. The work of the company will involve co-ordination of such diverse factors as the design of steel towers, satisfactory distribution and control of power required and a thorough knowledge of the optical and mechanical principles governing the use of modern floodlight projectors.

The service offered includes the entire design of the floodlighting system together with complete specifications and bill of materials on which actual quotations of material and installation costs will be made. In order to be able to supply all the material for the entire installation from steel towers to fuse plugs the Pyle-National Company has extended its line to include all necessary material, and in connection with the American Bridge Company a standard steel tower has been designed which, it is said, combines all the best features and introduces a number of economies, safety features and improvements.

W. N. Matthews Corporation Elects Directors

At the annual meeting of the stockholders of the W. N. Matthews Corporation, held in St. Louis, March 1, the following were elected as directors to serve for the ensuing year: W. N. Matthews, Claude L. Matthews, M. C. Cooley, Frank Y. Gladney and A. C. Carpenter.

Trico Announces New Sales Appointments

The Trico Fuse Manufacturing Company, Milwaukee, manufacturer of renewable fuses, announces the appointment of B. M. Slicting as sales promotion manager. He will be in charge of the sales promotion work at the company's main office in Milwaukee. J. E. Eldredge of South Windsor, Conn., was appointed as sales representative for Connecticut and the western part of Massachusetts.

Arthur E. Bacon, Denver, was appointed sales representative for Colorado, New Mexico, Utah and Wyoming.

General Electric Building Large Steel-Melting Transformers

Large-capacity transformers for use with steel-melting furnaces are being built by the General Electric Company for the Timken Roller Bearing Company and will be used in connection with the installation of two 25-ton melting furnaces of the Heroult type at Canton, Ohio. The transformers are being built in the Erie shops of the General Electric Company and will have a continuous rating of 7,500 kva., a short-time rating of 9,000 kva., and will operate on a 22,000-volt, three-phase, 60-cycle circuit. Three units of the water-cooled type are being built, two to be used to supply current for the two new furnaces, and the other to be reserved as a spare until an additional furnace is installed.

Boston League Opens Office

The Metropolitan Electrical League of Boston has established an office at 164 Federal Street in that city, and, as recently noted in the ELECTRICAL WORLD, Edward G. Jay has been appointed manager and will devote his full time to league activities. In an announcement it is stated that the league is maintained "for the purpose of conducting a businesslike and non-partisan policy of co-operation in the

industry." In addition to the usual representation of the four prominent branches of the industry, the Boston city wiring department is included in a recently formed membership committee.

The Elliott Company, Pittsburgh, has been awarded a contract by the town of Chillicothe, Mo., for a 1,500-kw. turbo-generator.

The A. C. Gilbert Company, Batchley Avenue, New Haven, Conn., manufacturer of electric fans, etc., has awarded a contract for a two-story and basement addition, 60 ft. x 85 ft. Lockwood, Greene & Company, Boston, Mass., are architects and engineers.

The Century Electric Company, St. Louis, announces that F. L. Hall has been appointed district sales manager in San Francisco, to succeed the late R. J. Davis. Mr. Hall has been in the San Francisco office since February, 1926, and prior to that served in the St. Louis district office of the company.

The Westinghouse Electric & Manufacturing Company has removed its Seattle offices from 3451 E. Marginal Way to the Lloyd Building, at Sixth Avenue and Stewart Street.

Fairbanks, Morse & Company, Chicago, have appointed W. J. McIntosh, formerly manager of the electric motor and hydraulic department of the company at Seattle, as manager of their Portland office. H. S. Emanuels will succeed Mr. McIntosh at Seattle.

The Pennsylvania Crusher Company, Liberty Trust Building, Philadelphia, announces the appointment of John Alden Plimpton as Western manager in charge of its Chicago office.

The Consolidated Lamp & Glass Company, Coraopolis, Pa., has placed on the market a universal holder by which shades can be satisfactorily attached to fixtures not originally designed to accommodate lighting glassware. The shade holder can be used with upright lamps, such as those on candle fixtures, and with pendent lamp fixtures having any style of holder or adapter.

The W. N. Matthews Corporation, St. Louis, manufacturer of electrical specialties and mechanical painting equipment, announces that it has transferred representation of the state of Utah to Arthur E. Bacon, 1429 Eighteenth Street, Denver, who also represents the company in the states of Colorado, New Mexico, Wyoming and in eleven counties of Nebraska. This territory was formerly covered by B. C. Holst, district manager in San Francisco, who will now devote his entire time to working in the states of California, Oregon, Washington, Nevada and Idaho. The company also announces that its Boston representative, H. Van Rosen, Statler Building, has added to his sales organization Arthur S. Hall, who will make his headquarters at 98 Longfellow Road, Worcester, Mass. The company further adds that the J. E. Sumpter Company, Minneapolis, Minn., has ceased to be its representative in the states of Minnesota, North and South Dakota and northern Wisconsin and that the announcement of a successor will soon be made.

New Equipment Available

Small Portable Turbo-Generator

A new 2½-kw. heavy-duty, portable turbo-generator, which is completely self-contained, so that it requires no switchboards, fuse panels or rheostats, and which has been designed automatically to maintain voltages with extreme accuracy despite wide variations of steam pressure, has been developed by the Pyle-National Company of Chicago. The new unit, which is known as type M-2-S, is designed to operate on steam. An automatic regulating mechanism is provided which will maintain uniform voltage under extreme fluctuations of steam pressure or load. The new control will hold voltages constant to within 3 volts of normal, even though the steam pressures vary all the way from 80 lb. to 200 lb.

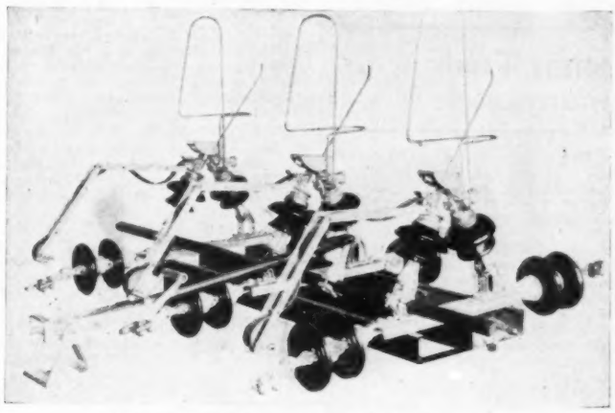
The unit is designed to operate continuously over long periods of time without any attention to either adjustment or maintenance. Heavy-duty ball bearings and large-capacity oil chambers enable the unit to run for months at a time without attention. Practically the only base necessary is a heavy plank or packing case sufficient to prevent breaking of the steam line. Careful attention has been given to waterproofing and weatherproofing, so that dirt and moisture will not interfere with operation. Another new feature is the mounting of an inclosed fuse panel and safety switch box as an integral part of the unit in place of the usual terminal box. This makes the unit complete in itself and avoids the necessity for additional wiring, fuse and switch arrangement when the unit is installed.

Dual Service Switch

A line of dual service-entrance control switches for duplicate feeders is provided for in capacities ranging from 30 amp. to 400 amp., 250-volt, two, three and four-pole, by a recent addition to the classification AA line of inclosed fused switches manufactured by the Palmer Electric & Manufacturing Company, Cambridge, Mass. The arrangement consists of two standard classification AA fused switches provided with a mechanical interlock that permits either one of two services to be connected to the load. Each service connection is fused and inclosed in a separate switch cabinet.

Strain-Type Tilting-Insulator Switch for Pole Mounting

A strain-type tilting-insulator pole-top switch which eliminates the upright insulating unit has been developed by the Line Material Company, South Milwaukee, Wis. The unit is made in ratings from 7,500 volts to 73,000 volts and in capacities from 200 amp. to 400 amp. The manufacturer states that it is a small, compact unit and has been developed along the same lines of interchangeability as all its high-tension equipment. It is so constructed that it will take care of any normal sag in the wire.



STRAIN TYPE SWITCH FOR POLE MOUNTING

The square steel operating shaft rotated by the 180-deg. operating handle is fitted with bronze bushings and babbitt-lined bearings, and the weight of the switch is so balanced on the mounting structure as to insure simple operation and quick break. Sleet hoods protect the contact clips from ice and sleet.

Small-Sized Gas-Engine-Driven Welder

A small gas-engine-driven welding outfit as an addition to its line of welding equipment has been announced by the General Electric Company. This set incorporates the G.E. WD-11 welding generator with a continuous rating of 150 amp. and a one-hour rating of 200 amp., the current range running from 50 amp. to 250 amp. The generator is equipped with a control panel, rheostat and self-adjusting stabilizing reactor. The outfit is particularly adaptable for oil field work, shop and garage work where portability is desirable or for any application where no power supply is available for driving a motor generator type of welder. The set is mounted complete on a structural steel base so designed as to facilitate easy moving from place to place.

New Trade Publications

ELECTRIC FANS. — The Robbins & Myers Company, Springfield, Ohio, has issued its large fan catalog, No. 1301, for 1927 covering the "R. & M." electric fans for alternating and direct-current circuits, non-oscillating, oscillating, ceiling and ventilating types. The company is also distributing a miniature catalog, No. 1302, containing illustrations and descriptions of its line of fans for 1927, and a dea er help portfolio, No. 1307, entitled "Building the Desire for 'R. & M.' fans," giving a complete layout of the material the company is prepared to furnish its dealers.

LIGHTNING ARRESTERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing folder F-4730, entitled "Facts," in which it describes the autovalve lightning arresters, taking up such points as valve action, construction, size and weight, mounting and other vital facts.

HOUSE BRACKETS. — The National Metal Molding Company, Pittsburgh, Pa., is distributing bulletin No. 18-001, covering the National single-point house brackets. Bulletin No. 18-002 describing the National one, two and three-point house brackets, series 5,000; and bulletin No. 18-003 covering the National house brackets, series 104, 105 and 106, and also insulators with bolts and toggles.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase or agency is desired in London, England (No. 24,356), for acoustic instruments, earphones or telephones.

An agency is desired in Hamburg, Germany (No. 24,346), for electrical equipment for foodstuff industries.

Purchase is desired in Durango, Mexico (No. 24,290), of generators and two electric motors of 80 hp. each.

An agency is desired in Guatemala, Central America (No. 24,302), for electrical household appliances.

An agency is desired in Prague, Czechoslovakia (No. 24,359), for electrical household appliances.

Purchase and agency are desired in Berlin, Germany (No. 24,307), for electric household appliances, such as floor polishers, vacuum cleaners and refrigerators. An agency is also desired (No. 24,339) for tools for electric and locomotive works.

Purchase is desired in Saigon, Indo-China (No. 24,385), of wiring supplies and fixtures.

Purchase and agency are desired in Berne Switzerland (No. 24,432), for electric control apparatus.

Purchase is desired in London, England (No. 24,431), of copper wire, dynamo wires, cables and insulated wire.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CONCORD, N. H.—Bids will be received by J. D. Deland & Company, architects, Statler Building, Boston, until Mar. 22 for extensions to the Margaret Pillsbury General Hospital, including nurses home, power house and connections, to cost about $150,000.

BOSTON, MASS.—Plans have been filed by the Edison Electric Illuminating Company for a substation at 1205 Commonwealth Avenue, to cost about $20,000.

FITCHBURG, MASS.—Plans are under way by Crocker-Burbank & Company for the construction of a new central steam plant, to cost about $600,000, for their four mills. Electricity generated at the plant will be used partly to drive paper machines in three of the mills. F. J. Sill, Westboro, is electrical engineer.

BRIDGEPORT, CONN.—The Connecticut Power Company has decided to discontinue its plant on Seaview Avenue and will contract with the Connecticut Light & Power Company and the New York, New Haven & Hartford Railroad Company for power to operate the local street railway system and the suburban line from Savin Rock to Norwalk. The Connecticut company will build two substations, one in Bridgeport and the other in Stratford, to cost about $200,000.

BRISTOL, CONN.—The City Council has contracted with the Connecticut Light & Power Company, Waterbury, for the installation of a new street-lighting system. The plans call for changing 330 small lamps from 60 to 100 cp., and the installation of forty-nine ornamental lamps in the business district, of which twenty-six 1,000-cp. lamps will be mounted on iron poles and twenty-three 600-cp. lighting units will be mounted on wooden poles.

Middle Atlantic States

BATAVIA, N. Y.—The Buffalo, Niagara & Eastern Power Corporation, Buffalo, is planning extensions in transmission lines in this section to connect with the lines of the Western New York Utilities, Inc., recently acquired.

BUFFALO, N. Y.—Bids will be received by the Commissioner of Mental Hygiene, Department of Mental Hygiene, Capitol, Albany, until March 30 for electric work and rewiring buildings at the Buffalo State Hospital.

FULTON, N. Y.—The water power rights of the Hunter Arms Company in Fulton have been acquired by the Fulton Light & Power Company. The Hunter plant, it is understood, will soon be operated by electricity.

GLENS FALLS, N. Y.—Plans are under way by the Union Bag & Paper Company for the construction of a new 50,000-hp. hydro-electric development in the Hudson River, at Glens Falls, to cost about $3,000,000.

POTSDAM, N. Y. — The St. Lawrence Valley Power Corporation has started work on a large power project on the St. Regis River at Allen Falls. The work will include a dam 40 ft. high, of the Ambursen type, water will be conducted to the power house through a large penstock. The power house will be located some distance below the falls and will have a capacity of 5,000 hp. New distribution lines will be erected this summer over the Parishville-Hannawa Falls line, to handle the increased load.

WATERLOO, N. Y.—Work will soon begin by the Empire Gas & Electric Company, Geneva, on the construction of a large substation in Waterloo. The company also plans to erect another high-tension line to connect the station with the transmission lines of the Niagara, Lockport & Ontario Eastern Power Company.

CARLISLE, PA. — The Carlisle-North Dickinson Electric Company, recently organized by officials of the Carlisle Light, Heat & Power Company, has applied for permission to erect a transmission line in Dickinson Township.

ELLWOOD CITY, PA.—The installation of an ornamental lighting system on Sixth Street is under consideration by the Borough Council.

PHILADELPHIA, PA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 15, for 175 condensers, 175 transformers, 75 voltmeters, etc. (Schedule 6860).

PORT ALLEGHENY, PA. — The Home Electric Company is planning to erect a transmission line from Couderport to Port Allegheny, to furnish service here.

BALTIMORE, MD.—Bids will be received by the Board of Awards until March 16 for a quantity of cast iron standards for the Division of Lighting. C. F. Goob is mechanical engineer.

FREDERICK, MD.—Plans have been filed by the trustees of Hood College for a power house, automobile service and garage building, to cost about $50,000.

ROSEWOOD, MD.—The State Hospital Commission, 330 North Charles Street, Baltimore, plans to install a cold storage and refrigerating plant at the Rosewood State Hospital for Insane and Feeble Minded, to cost about $40,000. W. W. Emmart, Union Trust Building, Baltimore, is architect.

BLUEFIELD, W. VA.—Extensions and improvements, to cost about $3,500,000, are contemplated by the Appalachian Power Company during 1927 in the vicinity of Bluefield. The work will include the erection of a transmission line from Switchback through Saltville to Kingsport, Tenn., a distance of about 80 miles. At Kingsport the line will connect with the eastern Tennessee division of the Carolina Power Company. Substations will be built at both Saltville and Kingsport.

McCOY, VA.—The Great Valley Anthracite Corporation, Calvert Building, Baltimore, plans to install electric power equipment, including substation apparatus, and mining machinery at its coal properties to be developed in this section. The cost of the project is estimated at $500,000.

North Central States

DETROIT, MICH. — The construction budget of the Detroit Edison Company for 1927 provides for an expenditure of about $32,000,000, and will include work on the Delray power house No. 3, which will have an initial installation of two 50,000-kw. turbines. Both stoker firing and pulverized coal are under consideration; about $1,500,000 will be expended on this project in 1927. Work is to be started on the sixth and last 50,000-kw. turbine at Trenton Channel, which will require about $3,000,000 this year. A 30,000-kw. turbine and one boiler, etc., are to be installed at the Marysville power house, at a cost of $1,500,000. The substation program calls for the erection of two large substations in the city, to cost $1,100,000; increasing the capacity of two existing stations, at a cost of about $1,250,000; erecting a direct-current substation, on the site of the Farmer Street heating plant, with a commercial office on the ground floor, to cost $700,000. Completion of the transmission substations at Navarre and West Warren, through which the output of the Trenton Channel power plant is delivered to distributing substations in Detroit. A 24,000-volt outdoor switching station is to be added to the Bloomfield substation. Two more automatic reclosing type distributing substations will be erected in Detroit. More than five million dollars will be expended for underground conduits and cables for the transmission systems. The sum of $3,500,000 is provided for service connections. Extensions will be made to the heating plant and steam distribution system, to cost more than one million dollars.

IRON RIVER, MICH.—The Peninsular Power Company, Madison, Wis., plans to build an outdoor type, automatic substation here, to cost about $75,000.

IONIA, MICH.—The Consumers Power Company, Jackson, plans to build an automatic substation here.

WILLIAMSTON, MICH. — The City Council has contracted with the Detroit Edison Company for the installation of an ornamental lighting system in the downtown district.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until March 25 for furnishing to the various departments of the city, board of education and public library, all "Mazda" lamps required for a period of one year. The cost is estimated at $50,000. Bids will also be received until March 18 for lead-covered cable, for the Division of Light and Power.

COLUMBUS, OHIO.—Bids will be received by J. E. Harper, until Mar. 24 for construction of power house at the Deaf and Dumb Institution, for the Department of Welfare, Ninth and Oak Streets, to cost about $55,000. H. B. Briggs, Ohio-Hartman Building, is architect.

GREEN SPRINGS, OHIO.—The installation of a new ornamental lighting system is under consideration.

LIMA, OHIO.—The City Commissioners have ordered the installation of underground conduits on South Main Street, from Kibbey Street to the Erie Railroad.

SALEM, OHIO.—The City Council is considering the installation of electric generating equipment in the waterworks pumping station. The installation of an ornamental lighting system in the downtown district, to cost about $13,600 is also under consideration.

LOUISVILLE, KY.—Bids will be received by the United States Engineer Office, Post Office Box 73, Louisville, until March

22, for furnishing and installing machinery and piping in power house, and turbine pit, piping in pipe trenches, and installing gate and valve operating machinery at Lock and Dam No. 47, Ohio River.

MARION, KY.—The Kentucky Utilities Company, Louisville, plans to install a series street-lighting system, to cost $4,800.

BLOOMINGTON, IND.—A bill now pending in the State Legislature provides for a ten year building program for the Indiana University at Bloomington, which includes a power plant for the university, to cost about $500,000.

SPRINGFIELD, ILL.—Permission has been granted the Central Illinois Public Service Company to erect and operate transmission lines from Tolono to Savoy, Rantoul and Gifford.

WOODSTOCK, ILL. — Plans are being prepared for extensions to the municipal electric plant. George E. Morris, Elgin, is engineer.

GREEN BAY, WIS.—The erection of a 66,000-volt transmission line from Sawyer across Green Bay, to cost about $34,000, is contemplated by the Wisconsin Public Service Corporation. This line is to be erected preparatory to further line extensions planned for Door County, particularly between Egg Harbor and Fish Creek.

DAVENPORT, IOWA. — The Peoples Light Company has applied to the Supervisors of Scott County for permission to extend its transmission lines to connect with the plant of the Dewey Portland Cement Company on the Buffalo Highway.

EAGLE GROVE, IOWA.—At an election held recently the proposal to issue $65,000 in bonds to establish a municipal electric plant was defeated.

SHELDON, IOWA.—A petition has been presented to the City Council asking that an election be held to vote on the proposal to issue $90,000 in bonds to construct a municipal electric light plant.

POPLAR BLUFF, MO. — Preliminary work has started on by the Black River Hydro-Electric Company on its proposed hydro-electric power project on the Black River near Piedmont, to cost about $5,000,000. The dam will be about 130 ft. high and 1,700 ft. long. The power plant will be located on the eastern bank of the stream, and water will be carried through a 700-ft. tunnel and after passing through the power house will rejoin the river several miles below the dam site. The company has leased the municipal electric plant in Poplar Bluff, and will furnish power from the new station when completed, for local service. W. A. Fuller, 1917 Railway Exchange Building, St. Louis, is chief engineer.

ST. LOUIS, MO.—Plans are being considered for replacing all gas red signal lamps at dangerous intersections throughout the city with electrically lighted signals.

ST. LOUIS, MO.—The Board of Public Service will soon ask bid for an electrical and mechanical service building, to be erected at Twelfth Street and Clark Avenue, at a cost of about $850,000.

DUNSEITH, N. D. — The Otter Tail Power Company, Fergus Falls, Minn., which has purchased the municipal electric plant, plans to erect a transmission line to furnish local service.

WHITE RIVER, S. D. — The Dakota Public Service Company, Sioux City, Iowa, which has acquired the municipal electric plant, plans to erect a transmission line to White River for local service.

FREMONT, NEB.—Bids will be received by the City Council until March 15, for extensions to the municipal electric plant, to cost about $89,000. The Burns & McDonnell Engineering Company, Interstate Building, Kansas City, Mo., is engineer.

MUNCIE, KAN.—The distribution system of the Rural Light & Power Company has been purchased by the Kansas City (Mo.) Power & Light Company, which contemplates improvements to the system, to cost about $35,000.

Southern States

SUMTER, S. C.—The Carolina Power & Light Company, Raleigh, has acquired a site 3 miles from Sumter on which it proposes to build a high-tension distribution station, and also extend its transmission line from Bishopville to Sumter via Oswego.

NINETY-SIX, S. C. — The Ninety-Six Cotton Mills, Inc., plans to increase the output of its power plant, at a cost of about $45,000. J. E. Sirrine & Company, Greenville, are engineers.

ATLANTA, GA. — Extensions contemplated by the Georgia Power Company include the erection of a 2,300-volt, three-phase distribution system and the installation of a 75-kva. 6,600/2,300-volt transformer station in Alpharetta; erection of a 6,600-volt, three-phase distribution system at Tunnell Hill, and a 6,600-volt, three-phase circuit from the Varnell-Ringgold line to Tunnell Hill, a distance of 4½ miles. The company will also rebuild the distribution and street-lighting systems in Mount Vernon and Siperton and will rebuild the distribution system in Tennille.

TYBEE, GA. — The Savannah (Ga.) Power & Light Company is planning to extend its line to Tybee to furnish electric service here. The plans include a street-lighting system consisting of fifty lamps of 400 cp.

PLANT CITY, FLA.—The installation of an ornamental lighting system, consisting of 171 lamps, is under consideration by the City Council. The street-lighting service is furnished by the Plant City Public Service Company.

CHATTANOOGA, TENN.—The budget of the Tennessee Electric Power Company for 1927 provides for an expenditure of about $5,000,000 for extensions and improvements, which includes $150,000 for the Hales Bar plants, and $100,000 for other plants in the state; for auxiliaries, switches, relays, etc., at various substations throughout the territory served by the company $200,000 is provided, of which $100,000 will be used for additions to the primary substations in the Chattanooga district. New transmission lines to be erected include a 11,400-volt line from Cleveland to Ooltewah, 14 miles long, and completion of a 11,400-line from Soddy to Graysville, 14 miles in length, and various lines will be built in middle and eastern Tennessee. About $400,000 will be required for new poles, line wire extensions, distribution transformers, meters, etc., during the year.

COWAN, TENN. — The Railroad and Public Utilities Commission has approved the franchise granted the Public Light & Power Company, Chattanooga, to establish an electric light plant here.

WALES, TENN. — The International Agricultural Corporation, Mutual Life Building, Buffalo, N. Y., is considering the installation of a 100-kva. steam-electric generating unit at its proposed local electric plant.

BIRMINGHAM, ALA. — A permit has been granted the Birmingham Electric Company to erect a substation at South Nineteenth and Powell Streets.

BIRMINGHAM, ALA.—Plans are under way by the Alabama Power Company for extensions to its transmission and distributing system in the Birmingham district. The work will include rebuilding the lines to increase the carrying capacity of the lines, increasing the output of the substations by 15,000 to 20,000 hp., to meet the increasing demand for service. Among the lines to be improved are those extending from Gorgas to Jasper, Gorgas to Barney Mines, Bessemer to Helena and Bessemer to Rock Castle.

BROOKHAVEN, MISS. — The Mississippi Power & Light Company, Jackson, plans to increase the output of its local power plant.

ELTON, LA.—The Gulf States Utilities Company, Lake Charles, plans to erect a transmission line from Jennings to Elton.

FAIRFAX, OKLA.—The Oklahoma Utilities Company has applied for franchises to supply electricity in the towns of Skedes and Blackburn.

INOLA, OKLA.—The Public Service Company of Oklahoma, Tulsa, has been granted a franchise to supply electricity in Inola for light and power. The company plans to extend its high-tension transmission line to furnish the service.

HOLDENVILLE, OKLA. — An election will be held on March 15 to vote on the proposal to issue $18,000 to install an ornamental lighting system in Holdenville.

LAWTON, OKLA. — The Southwestern Light & Power Company plans to build an ice-manufacturing plant at Third Street and Avenue B, to cost about $175,000.

BEAUMONT, TEX. — Steps have been taken by the Pearl Street Business Mens' Association for the installation of an ornamental lighting system on Pearl and adjoining streets in the downtown district.

CUERO, TEX.—Surveys are being made by the Central Power & Light Company, San Antonio, for the construction of a second large dam on the Guadalupe River, near Cuero.

RANKIN, TEX.—The West Texas Utilities Company, Abilene, which is extending its high-tension lines to Rankin, plans to install a small electric generating plant here, to be used as an emergency unit.

TEXARKANA, TEX. — The Texarkana Electric Company, we are informed, does not contemplate distributing electricity in Texarkana as reported in these columns in the issue of Feb. 26. The company was organized to conduct a merchandising and wiring business. The Southwestern Gas & Electric Company supplies electric service in the cities of Texarkana, Ark., and Texarkana, Tex.

Pacific and Mountain States

GOLD BEACH, ORE.—Application has been filed by J. C. Leith, Gold Beach, for a certificate of necessity and convenience to construct a hydro-electric plant and distribute electricity along the new Roosevelt Highway, from the town of Euchre Creek south through Weddertown and Gold Beach to Hunter's Creek, a distance of 5 miles.

ALTADENA, CAL.—Bids will be received by the Board of County Supervisors, Court House, Los Angeles, until March 21, for the installation of ornamental lighting system on Allen Avenue, totaling 374 standards, to cost about $75,420.

FONTANA, CAL.—Plans have been filed by the Southern California Edison Company, Los Angeles, for a local substation to cost about $40,000.

LAGUNA BEACH, CAL. — Plans are under way for the installation of an ornamental lighting system, including the installation of ninety-one standards and 15,350 lineal feet of conduit, etc., to cost about $25,000.

LOS ANGELES, CAL.—A permit has been granted the Department of Water and Power for a substation, to be erected at 3520 South Normandie Avenue, at a cost of about $100,000.

LOS ANGELES, CAL.—The City Council has authorized the installation of ornamental lamps on Union Avenue, using pressed steel standards. Also on portions of Sweetzer, Aerial and Rosewood Avenues, and Kings Road, using concrete standards.

MOCALNO, CAL.—James G. Dehy, Mocalno, has applied to the Federal Power Commission for a preliminary permit covering a 300-hp. project on Cottonwood and Lone Tree Creeks in Mono County.

MODESTO, CAL.—The City Council has authorized the installation of an ornamental lighting system on J Street, requiring 198 cast-iron standards. Frank Rossi is city engineer.

RIVERSIDE, CAL.—The Southern Sierras Power Company has applied to the Federal Power Commission for a license to cover a transmission line, 67 miles long, from San Bernardino to Rincon.

SAN LUIS OBISPO, CAL.—The Midland Counties Public Service Corporation plans extensions in transmission lines and additional substations at Santa Maria, Lompoc, San Ynez and vicinity, to cost about $200,000.

SANTA CRUZ, CAL.—Plans are being prepared for the installation of an ornamental lighting system on Front and Cooper Streets. James K. James is city engineer.

SANTA MONICA, CAL.—The City Council has authorized the installation of an ornamental lighting system on Santa Monica Boulevard, from Fourteenth Street to the northeast city limits.

MURRAH, UTAH. — The City Council has rejected all bids submitted for a Diesel engine generating unit, etc., for the municipal electric plant. New bids, it is understood, will soon be asked for. T. J. McDonald is engineer.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has applied for a license to cover a transmission line, 82 miles long, extending from its Wheelan switchboard to the American Falls plant.

FORT SHERIDAN, WYO.—Bids will be received by the Construction Division, Veterans' Bureau, Washington, D. C., until March 22, for the installation of a fire-alarm system at local hospital No. 86.

DENVER, COLO.—The Board of Water Commissioners is considering the construction of a municipal power plant at Marston Lake, to cost about $40,000. D. D. Gross is engineer.

FALLON, NEV. — The directors of the Truckee-Carson Irrigation District have authorized an extension of the Newlands project electric power system to Stillwater.

Electrical Patents

Announced by U. S. Patent Office

(Issued Feb. 15, 1927)

1,617,889. ELECTRICAL WATER HEATER; H. W. Woodgate and F. W. Slade, Melbourne, Victoria, Australia. App. filed April 8, 1926. Of the circulatory type.

1,617,912. MEASURING DEVICE FOR HIGH-VOLTAGE NETWORKS; H. Kafka, Berlin-Lichterfelde-West, and S. Klein, Copenick, near Berlin, Germany. App. filed Nov. 30, 1923. Particularly adopted to voltage and output measurements in double mains and three-phase current mains.

1,617,916. ELECTRIC HEATER; A. J. Kercher, Berkeley, Cal., and W. W. Hicks, San Francisco, Cal. App. filed Nov. 19, 1924. For a room; adapted to provide heat by radiation and convection.

1,617,923. SURGICAL BAKER; H. J. O'Neill, Rochester, Minn. App. filed March 4, 1926.

1,617,979. TUNGSTEN ARC LAMP; W. Zebrowski, Berlin-Neukolln, Germany. App. filed Jan. 20, 1925. Means for establishing an arc between pure tungsten electrodes in a nitrogen atmosphere. An oxide element is used for bridging the electrodes normally, and the electrodes are separated from the oxide body one after another, so that the arc is first formed between the oxide body and one of the electrodes and thereafter the arc is carried over to the second electrode, the second electrode having become heated in the meantime as a result of the formation of the first arc.

1,617,991. SYNCHRONIZING SYSTEM; T. L. Dowey, Newark, N. J. App. filed Dec. 24, 1923. Adapted to be used in connection with talking motion-picture systems.

1,617,995. PIEZO-ELECTRIC DEVICE; A. L. Ellis, Swampscott, Mass. App. filed July 14, 1925.

1,618,021. DISTRIBUTING BLOCK; H. J. Nenno, Rochester, N. Y. App. filed Nov. 20, 1923. For low-voltage decorative lighting.

1,618,058. ELECTRIC METER CIRCUIT; F. P. Church, Lynn, Mass. App. filed March 26, 1923. Method of adjusting for light-load-compensation integrating-type meters.

1,618,072. TROLLEY; J. I. Fearing and H. F. Wellman, Ashland, Ky. App. filed Oct. 7, 1924.

1,618,080. ELECTRIC WELDING APPARATUS; E. V. Gibbons, Boulder, Col. App. filed July 24, 1926. A simple welding device which can be operated with a comparatively small current and which is provided with a regulator by means of which the current may be controlled; intended primarily for use with small work.

1,618,087. OIL CIRCUIT BREAKER; J. D. Hilliard, Schenectady, N. Y. App. filed Aug. 15, 1921. With means for separating the ejected gas and oil and to permit the ready escape of the gaseous material so as to prevent an undue rise of pressure within the oil vessel. Means is further provided exterior to the vessel whereby the material may be cooled so that a portion of the same is condensed and returned to the main body of oil within the vessel and the remainder has its temperature so reduced that it may be safely allowed to escape into the atmosphere. Means whereby the arc is extinguished by a separation of the electrodes in a large body of cool oil, provision being made whereby a comparatively small quantity of oil will be ejected from the vessel.

1,618,101. ELECTRIC WATER HEATER; S. W. Malcolm, Jacksonville, Fla. App. filed Aug. 30, 1924. Immersion type.

1,618,103. SEARCHLIGHT; E. J. Murphy and L. P. Hutt, Schenectady, N. Y. App. filed May 17, 1920. Electromagnetic means especially adapted for use in connection with an arc lamp, making it possible to secure automatic control of the electrodes.

1,618,112. STORAGE BATTERY; A. Setzer, Providence, R. I. App. filed March 2, 1923. With special hold-down brace.

1,618,127. CLUTCH; L. S. Kubiac, Youngstown, Ohio. App. filed Aug. 26, 1925. For use in connection with the control of electric lamp carbons when the same are disposed in a plane other than perpendicular.

1,618,154. BELL AND BUZZER ALTERNATOR; V. E. Larsen, Chicago, Ill. App. filed Sept. 24, 1921. An attachment for a bell whereby a quiet signal may at will be substituted in place of the bell.

(Issued Feb. 22, 1927)

1,618,158. LIGHT, COLOR AND RADIANT-RAY BATH CABINET; G. L. Abell, Oakland, Cal. App. filed Aug. 16, 1920.

1,618,199. ELECTROPLATING MACHINE; J. Hulmer and K. Jonas, Chicago, Ill. App. filed May 15, 1926. A power-operated machine for plating articles in bulk.

1,618,251. ELECTRIC FUSE; J. F. Wentz, New York, N. Y. App. filed April 27, 1922. An electric fuse having its fusible element surrounded by coarse granules of pure silica of such size that the diffusion of gas due to the melting of the fusible element is freely permitted.

1,618,322. AUTOMATIC FIRE ALARM; C. C. Bettenhausen, Princeton, Neb. App. filed June 30, 1925. Designed to give warning of over-heated bearings.

1,618,334. HANGER; C. L. Greer, League City, Tex. App. filed April 6, 1925. For supporting a trolley wire from the messenger wire.

1,618,364. MOUNTING FOR HEATING UNITS; W. F. Clark and E. Stranszky, Warren, Pa. App. filed March 23, 1925. A construction in which they may be readily placed upon or removed from their mounting.

1,618,383. SPOT WELDER POINT AND POINT RETAINER; B. P. Lloyd, Detroit, Mich. App. filed Aug. 26, 1926.

1,618,411. ELECTRICAL FREQUENCY-MULTIPLYING SYSTEM; W. Doring, Berlin-Steglitz, Germany. App. filed Sept. 24, 1925.

1,618,422. SEGMENT FASTENER; W. Garrett and G. Gaylets, Old Forge, Pa. App. filed Nov. 30, 1921. Means for fastening in a position in a controller to eliminate destruction through the engagement of the contact fingers.

1,618,444. HANDLE FOR HEATED TOOLS; F. Kuhn and L. H. Thomas, Detroit, Mich. App. filed April 23, 1923.

1,618,495. SWITCH CONSTRUCTION; T. W. Varley, New York, N. Y. App. filed Oct. 15, 1920. In connection with apparatus for charging storage batteries from an intermittently actuated generator.

1,618,497. WELDING TRANSFORMER; C. B. Waters, Montclair, N. J. App. filed Feb. 4, 1924. With exaggerated magnetic leakage whereby greatly improved welding characteristics are attained.

1,618,526. HEAT APPLICATOR AND ELECTRODE; K. Fukuyama, Los Angeles, Cal. App. filed May 9, 1925.

1,618,528. STORAGE-BATTERY COVER; D. Grill, Roanoke, Va. App. filed Feb. 14, 1925.

1,618,581. TRAFFIC SIGNAL; F. F. Dendinger, Norfolk, Neb. App. filed June 11, 1924. Adapted to be used at the intersection of streets.

1,618,592. HEATER FOR HAIR WAVING; B. F. Jancke, New York, N. Y. App. filed Dec. 28, 1923.

1,618,672. ARC-WELDING SYSTEM; P. P. Pipes, Mansfield, Ohio. App. filed Sept. 16, 1926. A method and means to control a welding arc, which will reduce and limit the voltage of the arc below that of the source of supply and also limit length to which the arc may be drawn.

1,618,686. ELECTRIC IRON PLUG; B. G. Stephens, Auckland, New Zealand. App. filed Jan. 30, 1925.

1,618,723. PLUG ATTACHMENT; C. F. Pearson, Flushing, N. Y. App. filed May 4, 1925.

1,618,725. EXCITATION OF ALTERNATING-CURRENT MACHINES; D. C. Prince, Schenectady, N. Y. App. filed May 2, 1925. Regulating means whereby the voltage of an alternating-current machine may be maintained substantially constant irrespective of variation in its load current. An arrangement for stabilizing the operation of synchronous machines interconnected through long transmission lines or other highly reactive circuits whereby the line may be operated closer to its maximum power limit.

1,618,738. EMERGENCY LOCK FOR DOORS; M. Weiss, New York, N. Y. App. filed Feb. 25, 1926. May be controlled from some distant point.

1,618,743. METHOD OF FABRICATING THERMO-ELECTRIC UNITS; N. H. Adams, Schenectady, N. Y. App. filed March 31, 1925. Method of fabricating a multi-unit thermopile.

1,618,744, 1,618,745. THERMO-ELECTRIC GENERATOR; N. H. Adams, Schenectady, N. Y. Apps. filed March 31 and June 22, 1925. An arrangement for heating the hot junctions of the thermopiles comprising such generators.

1,618,755. THERMO-ELECTRIC GENERATOR; T. S. Fuller and N. H. Adams, Schenectady, N. Y. App. filed March 31, 1925. A thermopile unit with a convector or radiator so arranged and proportioned that the proper difference in temperature may be maintained between the hot and cold junctions of the thermopile.

1,618,757. SPEED REGULATOR; C. A. Hoxie, Schenectady, N. Y. App. filed Aug. 26, 1925. Particularly adapted for regulating the frequency of an alternating-current distribution system in accordance with the rate of a master clock in order that secondary clocks connected to the system shall indicate correctly.

1,618,761. HEATER; E. P. Landsberger, Hastings, Minn. App. filed May 7, 1926. Insertable in the oil-drain-plug opening of an automobile motor.

1,618,764. PROCESS OF SPOT WELDING OF ALUMINUM; E. Lunn, Chicago, Ill. App. filed Sept. 3, 1926.

1,618,766. CENTRIFUGALLY OPERATED CONTACT-MAKING DEVICE; Campbell MacMillan, Schenectady, N. Y. App. filed May 17, 1924. Particularly adapted to contact-making devices such as are used in starting alternating-current electric motors in which the secondary member is provided with a closed-circuited winding having a resistance in circuit with the winding for the purpose of producing a good starting torque, the resistance being gradually cut out of circuit step by step as the speed of the motor increases.

1,618,767. MANUFACTURE OF LUMINOUS ELECTRICAL DISCHARGE TUBES; R. R. Machlett, New York, N. Y. App. filed April 27, 1925.

1,618,771. SYNCHRONOUS INDUCTION MOTOR; F. W. Merrill, Fort Wayne, Ind. App. filed March 24, 1925. A synchronous induction motor comprising relative rotatable primary and secondary members, the secondary member obtaining its excitation entirely from the primary member and having salient poles which carry conductors of a secondary induction-motor winding, the tip of the salient poles being stepped off to increase the air gap between primary and secondary sufficiently to produce a substantial decrease in the effective polar salient between starting and synchronous operations.

1,618,784. ELECTRIC SWITCH; H. E. Slade, Glen Ridge, N. J. App. filed Nov. 11, 1926. As used in canopies or wall-bracket fixtures.

1,618,790. SHIP PROPULSION; G. O. Watson, Rugby, England. App. filed Oct. 30, 1923. Of the type wherein a propeller is driven by prime movers such as Diesel engines or elastic fluid turbines; to provide means whereby the generator and propeller motor fields may be controlled in a simple, reliable and efficient manner.

1,618,818. METHOD OF MAKING MAGNETIC CORES; W. Ehlers, Berlin-Ghunau, Germany. App. filed Dec. 29, 1924. Of pressed magnetic powder; for induction coils and similar purposes.

1,618,827. SHIP PROPULSION; D. E. Jewitt, Old Bilton, near Rugby, England. App. filed May 1, 1923. Wherein a propeller is driven by motors supplied with current from one or more direct-current generators driven by prime movers such as Diesel engines or steam turbines, and wherein means are provided for preventing injury to the apparatus.

1,618,894. INDICATOR AND AUTOMATIC WATER SUPPLY FOR STORAGE BATTERIES; W. C. Smock, Burrows, Ind. App. filed May 28, 1926.

1,618,909. ELECTRICAL CONNECTOR DEVICE; R. B. Benjamin, Chicago, Ill. App. filed Feb. 23, 1922.

1,618,939. ELECTRICAL RECEPTACLE; E. F. Marth, Brooklyn, N. Y. App. filed May 21, 1923. Wherein the contact devices of the plug will be uniformly related to the mating contact devices of the socket, so that in the act of closing the circuit by rotating the plug in the socket the contact devices of the plug will be firmly advanced against the mating contact devices of the socket, thereby creating a firm intimate relation to the respective contact devices without creating an arc and at the same time operatively closing the circuit.

1,618,962. DYNAMO-ELECTRIC MACHINE; J. C. Lincoln, East Cleveland, Ohio. App. filed May 13, 1921. Of greater capacity for a given weight, which for a given capacity shall occupy a smaller space; in which the magnetization set up by current in the armature is less; improved commutation; having a new method of reducing distortion of the magnetic field; having a field frame for dynamo-electric machines with pole pieces divided into a plurality of magnetically isolated portions, and with yokes of magnetizable material joining the several pole portions with the corresponding portions of the adjacent pole of opposite polarity.